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RADIATION THERAPY OF TUMORS WITH A CONSIDERATION OF THE POSSIBLE ADVANTAGES OF SUPERVOLTAGE X-RAYS*

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UNTIL recent years malignant new growths were considered to be purely surgical problems. The term "surgical problem" includes not only the technical procedure of removing a tumor, but also the care of the patient with the tumor. The surgeon is expected to see that the patient has the proper preoperative care and the management after operation that will restore him to the best possible health. Such a conception of the surgeon's duties was not always held. For a long period extending into the nineteenth century surgeons were simply technicians who did not dare to stay too long in one community. With the advent of antisepsis and asepsis, operations were made more safe and new operations were made possible. In this period surgeons were so engrossed in developing new technics that they had little time to consider the patients upon whom they were operating. Now the technic of surgical procedures is standardized to such a degree that surgeons have been able to turn their attention to the problem of the patient as a whole.

Radiologists are passing through the same evolution as did the surgeons, but a little more rapidly. It is about forty-two years since the x-ray was discovered. Those physicians who have specialized in the use of these x-rays have been, like the surgeons of the immediate past, so intensely interested in the technical problems involved that some have lost sight of the patient as a whole. Surgery could not have advanced to its present high state if surgeons had not realized that the patient was involved as well as that part of his anatomy containing a new growth. Now radiology, too, as a branch of medicine, has come to that stage of its development at which the radiologist must view the patient as a whole. He must be prepared to take temporary charge of that patient and to see that proper care is given before and after irradiation.

Due to the preoccupation of radiologists with their technical problems, many physicians and surgeons have developed the custom of sending their patients for a specified quantity of radiation to a tumor instead of referring them to a radiologist for his management and treatment. It should be evident that such a procedure is not for the good of the patient. A prime problem in radiation therapy is for the radiologist to take charge of the patient who is ill, rather than of a tumor that needs irradiation.

Once the diagnosis has been established and the necessity for irradiation therapy jointly decided, it is assumed too frequently by both doctors and laity that all that is needed is an x-ray apparatus and a technician to operate it. A knife never cured a patient of cancer but a surgeon with a knife has cured many. Similarly, an x-ray machine has never controlled a cancer, but a radiologist using an x-ray machine has controlled many. To such a radiologist each patient is a particular problem, and many factors have to be considered which require a thorough medical appreciation of the constitution of the patient

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and the type, size and location of the tumor, as well as a thorough knowledge of the handling of the x-ray apparatus so as to produce the most effective radiation.

The size and number of the areas which are to be treated must be considered in the light of the extent of the tumor, and the condition of the patient. Cachectic and anemic patients are known to stand radiation therapy very poorly, and hence only small areas can be irradiated, or small doses administered. The tumors in such patients respond very poorly. Even patients in the best of health cannot stand irradiation of too extensive areas of the body. With such facts in mind the radiologist must decide how many fields, and of what size, are to be used in applying the radiations.

The total dose desired must be determined in the light of the type of the tumor, its size and location. Some tumors which respond most easily and are called radiosensitive are the least curable. These shrink rapidly with the application of rather mild doses, but may require prolonged treatment if a cure is to be achieved. Other tumors are curable but are very resistant and require extremely large total doses which must be given in such a manner that the patient's normal tissues can stand them.

A decision on the total amount of radiation to be given requires a consideration of the number of days to be consumed in giving it. The total number of roentgens—the unit of exposure of x-rays—means little unless the total elapsed time and the daily distribution are considered. Some tumors respond best to a relatively small total dose given in a few days, while others require a larger total dose given in three or more weeks. The division of the desired irradiation into multiple daily sittings is necessary to preserve the integrity of normal tissues while delivering to the tumor a number of roentgens sufficient to destroy it. This question of the protraction of the dose is one that is only beginning to be understood. Not alone has the total number of days, and the amount of radiation to be given on each day, to be considered, but also the rate at which the radiation is to be given during each sitting.

It is a popular conception that the powerful machines which can deliver large amounts of radiation in short periods of time are the most effective. This may or may not be true. There is some evidence to show that radiation delivered in small amounts per minute is more effective in many cases than the same total quantity delivered in large amounts per minute. If this is found to be true, the trend will be toward the use of less powerful apparatus for longer periods of time, rather than toward more and more powerful machines.

The distance of the x-ray tube from the patient must also be considered. If a large area is to be treated as a single field, this distance must be great in order to obtain a uniform irradiation of the whole surface. Short distances can be used when a small field is to be treated. This target skin distance also controls to a certain extent the amount of radiation that penetrates to the depths. The greater the distance, the greater is the dose at any given depth. Skin lesions can be treated at short distances but deep-seated lesions require long distances.

Last, but not least, come the problems of the filter and the voltage to be used. These two factors control the quality of the radiation. With regard to the filter, the only statement to be made at present is that increasing the filter, either in thickness or in the density of the material used, cuts down the number of soft x-rays which reach the patient. No amount of filter can give harder rays than the hardest produced by the particular voltage being used. It is common knowledge that soft (or long wave-length) x-rays are absorbed in the skin and the subcutaneous tissues, while a greater proportion of harder (short wave-length) x-rays penerate to the depths. Hence, the choice of filters is governed by the depth to which we wish the radiation to penetrate before being too greatly absorbed.

The problem of voltage is probably the most vexatious one at the present time. There is a common belief, held by both the medical profession and the laity, that higher and higher voltages are synonymous with better and better treatments, and more and more cures of cancer. This popular feeling is stampeding radiologists into procuring apparatus capable of producing higher and higher voltages. Let us carefully consider the facts which are known at the present time. At the University of California Hospital we have an apparatus which, since 1934, has run at supervoltages for treatment purposes. For the past year it has been operating continuously at

one million volts. In adjacent rooms we have machines capable of producing 200 and 100 kv. radiations and we have endeavored to compare the physical and clinical observations on the various voltages as accurately as possible.

Radiations act on cancer cells and the surrounding tissues by means of the ionization which they produce in them. Within the range of x-rays available, the amount of ionization depends on the quantity of radiation that reaches and is absorbed by the tissues which we desire to affect. The voltage used regulates the energy of the x-rays produced, and is therefore the determining factor, up to a certain point, as to the depth to which the rays will penetrate before being largely absorbed. It was long ago conceived, therefore, that if x-rays could be produced by higher and still higher voltages, they would penetrate farther and farther into the tissues before being absorbed. When the advance was made from 100 to 200 kv. radiations, it was found that the rays could and did penetrate farther, and that more marked effects were produced in the depths.

It must be kept in mind that the increase in the quantity of effective radiation at a given depth must be in greater proportion than the increase in that quantity on the surface if the radiation is to be of value. A method of expressing the amount of effective radiation at depths in percentages of the amount on the surface was devised. These percentage figures are called depth doses. We have compared the depth doses produced by 1,000 kv. radiations with those produced by 200 kv. radiations.

It was found soon that the 1,000 kv. radiations penetrate better than the 200 kv. radiations. There is very little difference in the depth doses at from 4 to 6 cm., but, as greater depths are reached, the difference between the two becomes great. Using a field 20 by 20 cm. we found the depth dose at 10 cm. to be 46 per cent for 200 kv. and 55 per cent for 1,000 kv. radiations. It would seem until we look further into the problem, that higher voltage is very much better.

Since it is necessary to administer 100 per cent or greater depth doses to most tumors, it is obvious that more than one field of entry for the radiation is necessary. If the depth dose at 10 cm. is 50 per cent, and it is desired to give a dose of 100 per cent at a depth of 10 cm., the irradiation would have to be applied through two surfaces, 100 per cent to each. The accumulation of the two 50 per cent doses would give 100 per cent at the center point. The two portals of entry of the radiations would probably have to be directly opposite to each other. Some of the x-rays pass through the body and affect the skin on the opposite side. This is called the "exit dose." This exit dose is much greater for 1,000 kv. than for 200 kv. radiations, because of their greater penetration. In calculating how much the skin will get, the exit dose must be added to that directly applied. Hence the amount applied directly must be reduced more for the 1,000 kv. than for the 200 kv. radiations if the skin dose is to be kept at a total of 100 per cent. The smaller amount directly applied reduces in proportion the amount reaching the depth, and we find that the depth dose at the center of a body treated from directly opposite sides is not nearly as much greater as would be expected on a superficial consideration of the subject. In fact, we found that when thin parts of the body, such as the neck, are treated, a greater "center" dose can be given with 200 kv. than with 1,000 kv. radiations. The actual amount of the depth dose depends on the size of the fields irradiated. We found that if fields 10 by 10 cm. were used in parts up to 12 cm. thick, doses could be given by 200 kv. radiation as large as, or even larger than, those supplied by 1,000 kv. With large fields such as may be used on an abdomen, 20 by 20 cm., a thickness of more than 18 cm. was reached before any improvement in the center dose could be found with the higher voltage. Hence, from the aspect of physical measurement, it would appear that 1,000 kv. radiations are of increased value only when the parts to be radiated are thick, or the fields to be used are small, or direct cross-fire can be avoided.

Clinically, other facts are found. It is a very common belief that the effect on the skin is the sole factor limiting the amount of radiation which a patient can receive. This is not true. While treating lesions of the abdomen or pelvis it has been found frequently that the effect on the bowel, *i.e.*, the erythema produced in the mucous membrane, is the limiting factor. When we have used 200 kv. heavily filtered radiations, applied from a distance of 80 cm., the intestinal reaction has frequently become so severe that treatments had to be interrupted or altered be-

fore the skin had received its maximum dose. The effect on the lungs when treating over the chest, and the effect on the mucous membrane of the throat when treating over the neck are known to limit treatments in those regions. It would seem that with 200 kv. radiations we are able to get as great a dose into the depths of the body as can be tolerated by the normal tissue in many cases. One thousand kv. radiations can do no better than this. Some other method of differentially affecting the tumor more than the normal tissue around it must be found.

Without further discussing the points involved, our general conclusions may be stated. First, supervoltage delivers greater depth doses from a single field, the differences being more marked the smaller the field and the greater the depth considered. Secondly, with supervoltage radiations there is less scattering into the adjacent tissues. Thirdly, the amount of x-ray in a supervoltage beam does not fall off so markedly on the edge as it passes through the body. This results in a more uniform dose to all points at a given depth. Fourthly, when using cross-fire technic, the large exit doses offset to some extent the practical value of the larger depth doses, the supervoltage being advantageous only if (a) direct cross fire can be avoided, (b) the part is thick, (c) multiple small fields can be used without excessive overlapping of the exit skin fields.

The 1,000 kv. apparatus has been in operation only since May, 1934. Five-year "cures" are therefore not yet in existence. We have, however, compiled some statistics for various lesions which show the unfortunate fact that, with the number of patients already dead, we cannot expect any great improvement in the five-year results when the necessary time has elapsed. It should be remembered that the same technic, except for voltage, has been used on the 200 and 1,000 kv. machines. Let us now consider what has been accomplished with specific lesions.

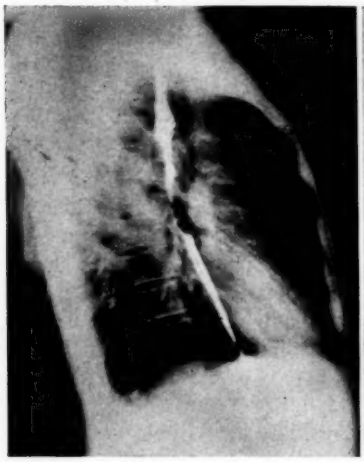

Fig. 1. Patient A. B. Cancer of the esophagus.

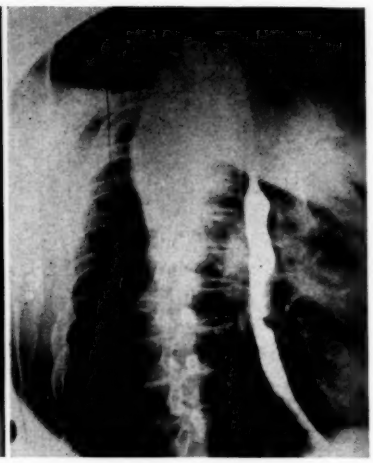

Fig. 2. Same patient as Figure 1, eight months after x-ray therapy to the cancer of the esophagus.

Cancer of the esophagus is recognized as a hopeless disease. Eight patients suffering from it have been treated, six are dead. Of the two alive, one has survived a year, and the other nine months, since the beginning of treatments. Both are comfortable at the present time.

Figure 1 shows the lesion in the middle third of the esophagus of patient A. B. as seen on July 6, 1936. Following this examination he was given 250 r per day to a total of 2,500 r per field to four fields in a period of 23 days. Figure 2 shows the same patient eight months later. Preceding the first examination a biopsy was taken by means of an esophagoscope. Following the second examination another esophagoscopy was performed and no evidence of the previous cancer could be found. The patient is at present enjoying very good health.

Figure 3 shows the biopsy specimen of a second patient, G. S., who had a similar lesion in a similar place. This patient received a prolonged course of therapy, following which his ability to swallow was improved. The treatment ended on January 22. On February 28 the patient died and an autopsy was obtained. Scarcely any evidence of the carcinoma of the esophagus could be found, but there were evidences of fibrosis of the lung. The patient also had pernicious anemia, generalized arteriosclerosis, mild diabetes and terminal bronchopneumonia. Figure 4 shows one of the few small islands of cancer cells which were demonstrated after making serial sections of the esophagus. It is easily seen that, whereas the cells in the specimen taken before treatment appear to be growing wildly and invading widely, those in the section made after irradiation appear to be adult in type with no evidence of growth and to be encapsulated. It is evident that in this case the x-rays had almost eradicated the tumor.

Fig. 3. Biopsy specimen of cancer of the esophagus. Patient G. S.

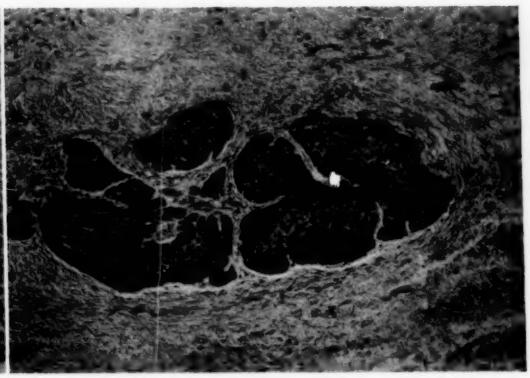

Fig. 4. Specimen from autopsy of patient G. S. showing encapsulated islands of cancer tissue one month after x-ray therapy.

In treating cancer of the uterus we have cooperated closely with the Department of Obstetrics and gynecology, headed by Dr. Frank Lynch. Most of the patients were given local radium treatments by members of that department, followed at once by external irradiation. Sixty patients have been so treated. Of these, twenty are dead, twenty-one are alive with some evidence of cancer, and nineteen are alive without evidence of cancer. During the immediately preceding period of two years and seven months, during which 200 kv. radiations were used, 63 patients were treated. At the end of that period, twenty-one were dead, eighteen alive with some evidence of cancer, and twenty-four alive with no evidence of cancer. In this series there were four patients with cancer in the first stage, while in the 1,000 kv. series there were none with the disease in that early stage. Even taking this fact into consideration, it is obvious that the 1,000 kv. radiations have produced no better results than the 200 kv. radiations.

Several of the uteri that had been irradiated thoroughly were removed by Dr. Lynch at varying intervals after the treatments. A very radical Wertheim procedure was performed. This was done in order to see what happened to the irradiated tumors and the surrounding tissues. He found that foci of tumor cells which appeared to be alive were found frequently and that the surrounding tissues showed a considerable amount of unfavorable change. Such findings as these give us a new conception of what happens after irradiation. In deciding on a practical course to follow in treating patients with cancer of the cervix, we must still rely on the fact, shown by so many authorities, that radiation produces as high a percentage of five year survivals as any other method, and a much lower mortality than surgery. The patient is interested in living as long as possible, even if she has a few foci of cancer cells encapsulated in the pelvis.

The patients having cancer of the breast have had such varied combinations of treatment that little can be concluded from our statistics. All of the patients with early cancers were operated on, and either received no radiation or only a

TABLE I. PATIENTS TREATED WITH 1,000 KV. RADIATIONS DURING TWO YEARS AND SEVEN MONTHS

Location	Alive Without Evidence of Cancer	Alive with Cancer	Dead	Total
Brain	1	3	13	17
Breast	8	12	17	37
Larynx	4	4	6	14
Lung	0	4	18	22
Esophagus	0	2	6	8
Ovary	3	4	7	14
Pharynx	2	4	5	11
Prostate	0	7	9	16
Testicle	6	2	4	12
Thyroid	5	2	1	8
Uterine Cervix	19	21	20	60
UterineFundus	4	1	4	9

postoperative course. Thirty-seven patients in all were treated. Of these, seventeen are dead, twelve are alive with evidence of the disease, and eight are alive with no evidence of cancer. Of these eight, seven received only post-operative irradiation and were probably cured of cancer by the surgery. Ten patients were treated by x-ray alone. They had either extensive axillary metastases or some complicating disease. Six are alive and comfortable, but still have evi lence of cancer. Three are dead. Only one is alive with no evidence of malignancy.

An examination of some breasts removed solely for study after thorough irradiation showed that most of them had some cancer tissue persisting, but always altered considerably by the treatments. This finding is the same as reported above for esophageal and uterine carcinomata.

The problem of deciding the most practical method of treating cancer of the breast is solved by analyzing the statistics of the results of surgical treatment. In our clinic, Dr. E. I. Bartlett did this some years ago and found that the only patients with a high percentage of cures by surgery alone were those with a small movable tumor in the outer half of the breast and no palpable axillary metastases. In all other cases the percentage of cures was so low that other methods of treatment should be tried. As a result of this I recommend that all patients except those with lesions of the type noted above be given a thorough course of radiation, followed by a radical operation if there is no spread beyond the axilla, and if it seems practically possible to remove all the axillary lymph nodes after the reaction to irradiation has subsided.

Space does not permit a discussion of all types of cancer treated, nor would it be profitable. Table I shows the statistics for many of the cases treated between May, 1934, and December, 1936, by 1,000 kv. radiations. These patients were not all treated by irradiation alone. From the table we can gather the significant and disappointing fact that there are so many patients already dead that few will be living at the end of five years.

I have not tried to deal with the results of radiation therapy as a whole, but I have tried to show that very little improvement in results is to be expected from 1,000 kv. radiations. It would not be doing justice to radiation therapy to conclude this discussion on such a pessimistic note. Every physician knows of some patients who have been cured by this means. They are the ones who have presented themselves with very localized cancers. The statistics and the microscopic evidence of persisting cancer in treated patients do not tell the complete story. A great many patients who come in suffering severely from cancer can be relieved of a large part of their suffering. Their tumors can be reduced in size, and an attitude of depression changed to one of hope. The older textbooks are filled with pictures of emaciated, suffering patients in advanced stages of cancer. By our radiation methods we are able to keep many such patients comfortable until they die of internal metastases, such as those to the liver, and their deaths are much less painful.

Summary

1. The status of the radiation therapist is considered and it is shown that, if he is to be of the greatest value to those suffering from cancer, he must take his place beside the surgical therapist as a well-rounded physician. He can no longer remain a "technician," interested only in administering a dose of x-ray to a tumor, without concerning himself with the patient who has the tumor.

2. The method of giving x-ray therapy has

not yet become standardized. There are many factors to be considered. Each patient is a new problem, and a great deal more depends on the clinical judgment and technical knowledge of the physician administering the x-ray therapy than on the particular apparatus he uses.

3. Many factors have to be considered before giving x-ray therapy:

(a) The size of the area to be irradiated depends on the extent of the primary tumor and its spread; and on the condition of the patient.

(b) The total dose to be applied depends on the type, size and location of the tumor. The number of days required for giving the treatment, and the rate at which the x-ray is applied at each sitting are of great importance.

(c) The voltage to be used is the most pressing question at the present time. The popular conception that higher voltage means better treatment is not generally true. More powerful machines are not necessarily more useful. A comparison is made between the physical measurements obtained by using 200 kilovolt and 1,000 kilovolt apparatuses. For thicknesses corresponding to many parts of the body, as large a dose can be given to internal parts by 200 kilovolt radiations as by 1,000 kilovolt radiations. Clinically it is unnecessary to go above 200 kilovolts in order to get as large a depth dose as can be tolerated. Advances in x-ray therapy are as likely to result from a better use of the apparatus we now have as from new kinds of apparatus.

4. Various specific tumors are discussed as to the method of treatment and the effect of the supervoltage x-rays on them. The number of patients who have died in the two and a half year period during which the million volt therapy machine has been in use indicates clearly that no very appreciable advance has been made by increasing the voltage.

5. The number dead or the number cured does not tell the whole story. Many of the patients treated were made much more comfortable and their remaining years of life more enjoyable.

THE ENERGY METABOLISM OF THE HEART IN FAILURE*

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THE failing heart is, in general terms, one that is unable to pump sufficient blood to meet the needs of the body. From the point of view of etiology there are many kinds of heart failure, but to focus attention on a single phase of the problem, only myocardial failure will be considered, without reference to the complicating factors of disturbances of rhythm and conduction, and disturbances in coronary blood flow. It is not implied that the principles to be discussed do not apply in the presence of complications due to the aforementioned factors, but the case is simpler when these conditions are excluded.

In the experimental animal, one can study either acute or chronic failure by experiments. To simulate most closely the more common types of failure it would be desirable to do experiments of the chronic type. Unfortunately, methods for study of the more important factors in long-time experiments are not available and therefore experiments have had to be limited, for the most part, to acute situations. Reasons will be advanced for believing that the results so obtained may be applied to the solution of the clinical problem.

A reduction in the ability of any machine to do work might conceivably be due to either one of two factors. Either the amount of energy available may be diminished or the ability of the machine to convert available energy into work may be impaired. Without experimenta-

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The work on digitalis glucosides reported in this paper was subsidized partly by funds from the Graduate School of the University of Minnesota and by a grant from the Sandoz Company.

tion it would be impossible to decide which of these two mechanisms were responsible for the failure of the heart to do its work when it deteriorates.

There are several chemical processes involved in the liberation of energy in muscle contraction. According to the best evidence available at the present time, contraction is associated with a breakdown and subsequent resynthesis of creatine phosphate and adenyl-pyrophosphate, and with the formation of lactic acid from glycogen through several intermediate steps. In the ultimate recovery from contraction there is an oxidation of carbohydrate and fat, liberating energy for the restoration of the system. The stores of creatine phosphate and glycogen might possibly be depleted in the failing heart and thus there might be a lack of the materials which provide the immediate source of energy for the contractile process.

Experiments conducted in collaboration with Mulder[14] showed that so long as the heart was supplied with adequate oxygen there was no significant decrease in glycogen stores. Therefore, it seems very unlikely that failure should be due to the lack of carbohydrate in the heart.

The question of a possible lack of creatine compounds in the failing heart has been attacked from several angles and the results indicate, as will be seen below, that this factor is probably not the critical one in most types of failure. Several investigators have measured the creatine content of hearts in relation to failure. Seecof, Linegar, and Myers[10] made the first extensive investigation. Hermann, Decherd and Oliver[5] studied the creatine content of human heart muscle in 105 cases. They found a 30 per cent decrease in creatine in the congestive failure cases as compared with the normal. Bodansky and Pilcher[1] studied the creatine content of the human heart at autopsy in 310 cases. The hearts from patients dying from congestive heart failure showed somewhat less creatine than did the hearts of normal individuals. There were some failing hearts, however, wich had a creatine content well within the normal range and the average depletion was only a little more than 20 per cent. In view of the finding of high creatine values in some of the congestive failure cases and particularly in view of the fact that terminal anoxemia is apt to be present longer in patients dying of congestive failure than from other diseases, particularly than in the case of accidental death, it seems that these results must be taken to indicate that the decrease in heart muscle creatine is not the main causative factor in this type of failure. The work of Hermann and Decherd[4] would seem to indicate quite clearly that when the blood flow, and consequently the oxygen supply to tissues are interfered with as in the case of infarction, the creatine content of heart muscle does drop abruptly. The changes that occur in infarction, however, have no particular bearing upon our present problem. Furthermore, there is no significant accumulation of creatine in the blood of the heart-lung preparation when the heart fails. Previously unpublished experiments show that the creatine content of the blood in the heart-lung preparation varies between 3.4 and 7.3 mg. per cent. In two out of five experiments there was an increase of 0.5 mg. per cent in three hours of progressive failure and in three experiments there was no change. If creatine phosphate were to have been lost from the heart it might have been expected that one would find an increase in creatine in the blood. Since this did not occur it may be inferred that there was no loss of creatine phosphate from the muscle during these periods.

Further evidence concerning the availability of energy in the failing heart is to be found in observations on the total oxygen consumption. When recovery from contraction is occurring in a normal way the oxygen consumption of muscle is an index of its total energy expenditure. This is true because the muscle is restored to its resting state by oxidation processes, and in the last analysis all the energy of contraction must come from the oxidation of either carbohydrate or fat. Thus a determination of oxygen consumption should provide a means of measuring the total energy output of the heart in contraction under various circumstances. The only requirement that must be satisfied in order that this may be a valid procedure is that the heart be adequately supplied with oxygen. This can be accomplished readily in the heart-lung preparation, which has been used for studies on this question.

As an introduction to what will be said concerning the metabolism of the heart in failure,

certain general principles regarding the dynamics of heart muscle should be reviewed. First one should consider the normal mechanisms of response of the heart to changes in its load. Starling[11] formulated as the Law of the Heart, the rule that in order to do increased work the ventricles of the heart must dilate. In Figure 1 is presented a composite and somewhat schematic diagram of the results of many experiments on this question. When the work that the heart is made to do is increased by raising the venous pressure, thus increasing the filling, the diastolic volume of the ventricles rises. Again, when the arterial resistance is increased, producing a hypertension, the heart is able, after a few beats to eject the same amount of blood as before, but from a greater diastolic volume. When the inverse changes in filling pressure and arterial resistance are made, the diastolic ventricular volume diminishes. In every case, unless the heart is failing, or excessive loads are imposed, the heart arrives shortly at a constant diastolic volume, which it maintains until a change is made in the filling, or in the peripheral resistance. The general rule may be derived from such observations that when the heart is called upon to do increased work of any type, it adjusts itself by virtue of the fact that the residual blood increases to the requisite quantities so that the diastolic volume will be great enough to permit the heart to eject a quantity of blood equal to that delivered to it during each cardiac cycle. Or, stated more simply, if somewhat less completely, the heart responds to the imposition of more work by diastolic dilatation. The process, moreover, is reversible.

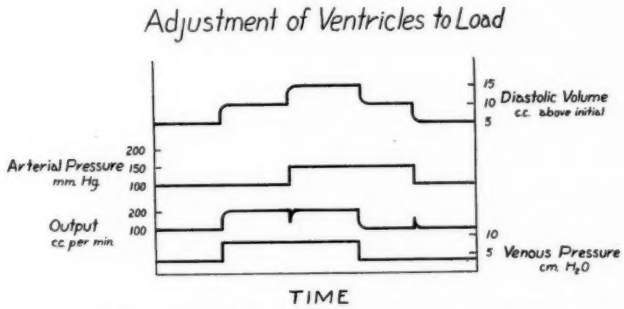

Fig. 1. Schematic, composite diagram showing mechanism of adjustment of mammalian heart to increases and decreases in load.

The ability of the heart to do larger amounts of work at greater diastolic volume results from the fact that the amount of energy liberated in contraction is dependent upon the diastolic volume or fiber length.[12] Regardless of whether the increase in diastolic fiber length is brought about by increased arterial pressure or increased filling, the oxygen consumption or total energy liberation is the same at any diastolic volume. It becomes apparent that the diastolic volume law is valid because energy liberation depends upon diastolic volume. The heart is able to do more work when it dilates under increased pressure or increased filling because at the greater diastolic fiber length more energy is liberated.

It has long been known that the amount of work the isolated heart is able to do, contracting from a particular diastolic volume, diminishes with time. This phenomenon has been referred to as spontaneous failure in the isolated heart. At least superficially, and it is believed fundamentally as well, this phenomenon is not dissimilar to failure in the clinical sense, which is also associated with cardiac dilatation. In clinical heart failure the heart dilates even though it is called upon to do a minimal amount of work. Transferring the results from the heart-lung preparation to the case of the human heart, we would say further that in failure the heart dilates in order to do a constant minimal amount of work. From the point of view of the pathologic physiology of the heart this point is of prime importance. Dilatation is a mechanism of adaptation and is not in itself an unfavorable, but rather a desirable reaction. It is only the underlying conditions which make

dilatation necessary which are unfortunate. The ability of the heart to dilate in failure is actually a life saving compensatory mechanism.

The important question arises as to whether the necessity for dilatation in failure in order to carry a constant load is occasioned by a decrease in the total energy liberation or by a decline in the efficiency of utilization of energy by the contracting muscle. This problem has been attacked experimentally in the mammalian and the amphibian heart. In the simplest case, that is, in the single ventricle of the turtle, the work performed and the oxygen consumption were measured[8] and it was found that the latter was constant when the diastolic ventricular volume was held constant over three hours of beating, but the work that could be done fell off markedly. This finding means that the proportion of the total energy used which was put to useful work decreased. In other words the efficiency of the ventricle as a machine decreased as the heart muscle failed. The efficiency which was originally 17.5 per cent or thereabouts in most fresh hearts, fell to as low as 5 per cent in three hours.

In the mammalian heart this general principle has been confirmed.[7] The heart-lung preparation removed from the dog's body and placed in a closed chamber immersed in a constant temperature bath was employed. The ventricular volume was measured by placing the heart in a cardiometer, the work was controlled by altering the venous inflow, and the energy expenditure was calculated from the oxygen consumption. It was found that except when massive edema of the heart or lungs occurred, the diastolic volume law was valid even when the heart failed badly. It is possible to induce or accelerate failure in the heart-lung preparation by the administration of histamine or by adding anesthetics to the blood. It was found that histamine tended to diminish the energy output at constant external diastolic volume but it could not be definitely ascertained whether the histamine effect in this regard might not have been due to the massive edema which it produces. Anesthetics such as amytal and alcohol decreased the work that the heart was able to do without correspondingly influencing the total energy liberation. In other words their effect was specifically upon the efficiency of the heart muscle. In spontaneous and induced failure, therefore, the heart is seen to be a less efficient machine than it is when normal. The energy that can be put into contraction is as great as before, but a smaller fraction of it is usefully employed.

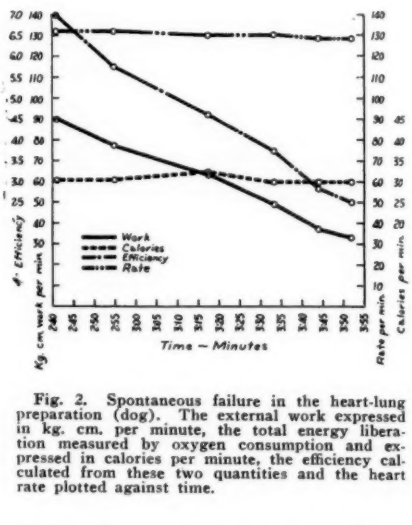

Fig. 2. Spontaneous failure in the heart-lung preparation (dog). The external work expressed in kg. cm. per minute, the total energy liberation measured by oxygen consumption and expressed in calories per minute, the efficiency calculated from these two quantities and the heart rate plotted against time.

In Figure II are presented the results of an experiment performed in the present study, illustrating the decreased efficiency which occurs in spontaneous failure in the heart-lung preparation when the diastolic volume of the ventricles is maintained constant over the course of an hour. It will be noted that the work which the heart could do at constant diastolic volume diminished so greatly over this period of time that the efficiency of the heart declined about 60 per cent.

In all, more than 100 experiments have been performed in which spontaneous failure has been observed and in none of the cases, unless massive edema has developed, has there been any significant deviation from the findings presented above as typical.

Various factors alter the rate at which failure occurs in the heart-lung preparation. It was found[15] that the addition of a small amount of insulin would improve the condition of the heart when it is first added to the perfusion fluid. After the first injection of insulin in a given preparation, subsequent injections have no further effect. Furthermore, the improvement is only temporary and progressive failure super-

venes after a short time. Likewise the addition of glucose to the circulating blood improves the condition of the heart muscle with respect to its efficiency. In spite of high blood sugar levels, however, the heart eventually fails as it does when the blood sugar is allowed to fall. These factors, although important, do not prevent myocardial failure for any length of time. Increasing the calcium content of the blood was found to increase both the energy liberation and the efficiency of the dog's heart.[8]

The only agents so far investigated capable of permanently increasing the work and the efficiency of the heart in the preparations we have employed are the glucosides of the digitalis series. This fact seems to be not without importance in understanding the physiological mechanisms by which the digitalis glucosides act. There has been great confusion in the literature regarding the mechanism of the therapeutic action of digitalis. The monographs of Cushny[2] and Luten[6] may be consulted in connection with the history of the subject. It is sufficient for our purposes to say that there has been no clear evidence of a therapeutically useful effect of digitalis upon the heart muscle itself, until recently. The most obvious effects of digitalis upon the heart of experimental animals are upon excitation and conduction. The occurrence of increased tonus, so-called, in the ventricle has long been known, but there is no necessary relationship between increased tonus and increased work capacity. Several investigators have performed inconclusive experiments on the effect of digitalis glucosides in the heart-lung preparation, failing in general to control the diastolic ventricular volume, and no consistent results were obtained until the problem of the work capacity of the failing heart was investigated at constant diastolic fiber length.[7] It was found that strophanthin, scillaren-B, ouabain and the digilanids of Stoll[13] all had a beneficial effect on cardiac efficiency, producing an increase of as much as 200 per cent in this factor.

A further study has been made of the action of the three components of the digilanids in digitalis lanata. These purified, crystalline, natural glucosides have been studied separately.* As might have been anticipated their activities are quite different. Digilanid C is from five to ten times as potent in producing an increase in efficiency as is digilanid A. An example is given in Figure 3 of an experiment in which 2 mg. of digilanid A was administered after

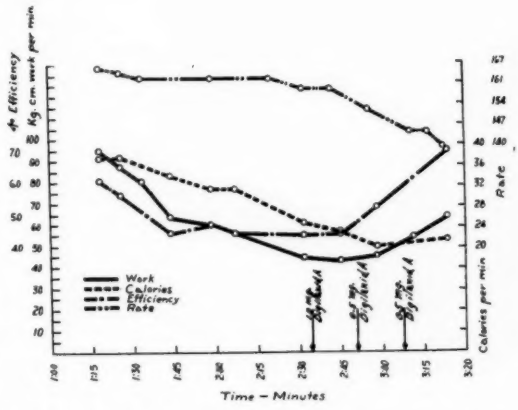

Fig. 3. The effect of 2.0 mg. digilanid A on energy liberation, work, efficiency, and heart rate in the heart-lung preparation.

a period of failure and the resulting change in efficiency was from 4.5 to 7.0 per cent. In a comparable experiment, Figure 4, 0.2 mg. of digilanid C increased the efficiency from 5.3 to 10.0 per cent. The effects of digilanid C come on somewhat more rapidly than do those of digilanid A. This seems not to be due to differential solubility, because the C is less soluble that the A. Rothlin[9] has reported that by the ordinary cat assay method, digilanid C is only slightly more active than digilanid A. By the frog's heart method digilanids A and D have identical activity according to Rothlin. These methods really measure the toxicity of digitalis bodies, giving the dose necessary to kill the animal or to stop the heart. It is quite evident that the toxic dose method does not give evidence concerning the efficiency-increasing power of digitalis glucosides. The classical methods of assay may give useful information in indicating the fatal dose of a glucoside preparation but since equally toxic substances may have ten-fold differences in their therapeutic actions it is obvious that one should not expect such methods of assay to give reliable information as to the more important actions of the drugs, assuming for the purpose of this argument that the increase in the ability to do work is the thera-

*I am indebted to the Sandoz company for a supply of the separate digilanids A, B, and C.

peutically desirable action of digitalis. Only two experiments have been performed up to this time on digilanid B and it is therefore impossible to make any statement as to its actions other than to say that it is very much less active than the digilanid C.

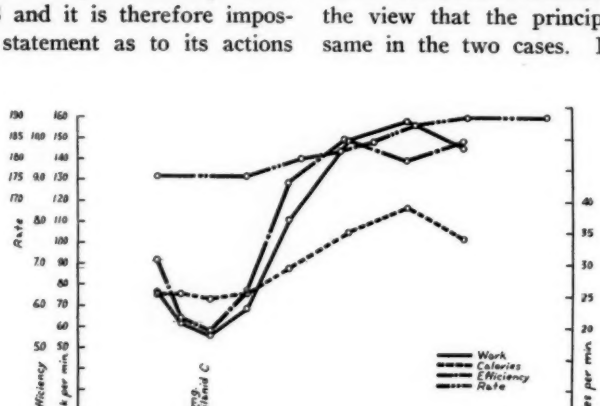

Fig. 4. The effect of O.2 mg. digilanid C on energy liberation, work, efficiency, and heart rate in the heart-lung preparation.

In connection with other reputed cardiac tonics, the action of coramine should be mentioned. The effect of this widely used drug upon cardiac efficiency was studied[7] and it was found that its action upon the heart muscle was deleterious, in the sense that it resulted in a decreased efficiency. It would, of course, be inappropriate to condemn this drug generally because it has one undesirable action, inasmuch as it might be useful in producing a peripheral vaso-constriction or in stimulating respiration, in spite of an unfavorable direct action on cardiac muscle. However, there are many circumstances which might arise in which such a drug as coramine might be employed, and in which the efficiency of the heart muscle might be the critical factor in determining the life or death of a patient. Under such circumstances the employment of an agent which decreases the amount of work the heart can do with a given expenditure of energy is definitely contraindicated.

Finally, the justifiability of the use of the acutely failing heart-lung preparation in such studies as these should be considered. It must be recognized that one is unable to prove that the situation in the dog's heart is comparable to that in the chronic failing human heart. There is, however, much collateral evidence to support the view that the principles involved are the same in the two cases. In both instances the heart has to dilate in order to do the same amount of work. In both, a decrease in the load results in a decrease in diastolic volume. Moreover, in both, the therapeutically useful digitalis glucosides result in a decrease in ventricular volume. There is no evident discrepancy between the situation in the two cases. The burden of proof would therefore seem to be upon those who would deny the legitimacy of the transference of conclusions drawn from experiments on failure in the dog heart to the situation in uncomplicated myocardial failure in man. As noted above, disturbances in conduction, rhythm and coronary circulation complicate the situation, and also, it may be added, when hypertrophy is involved the problem is obviously less simple. It is beyond the scope of this paper to enter into a full discussion of these complications but it is the author's opinion that with certain minor reservations, the general principles described still hold.

Summary

1. The inability of the heart to maintain its work output in failure has been shown to be associated with a decrease of the mechanical efficiency of the heart muscle.

2. The efficiency of the failing heart can be increased temporarily by the administration of

glucose, insulin or calcium salts. It is profoundly improved by the administration of glucosides of the digitalis series. It is suggested that the major factor in the beneficial effect of digitalis in myocardial failure is the improvement in mechanical efficiency.

3. The several glucosides from digitalis are not equal in their potency in this regard nor is the effect on efficiency parallel with the toxic properties measured by the usual assay methods. There is as much as a ten-fold discrepancy between therapeutic efficiency and toxicity determination by the frog's heart and the cat method.

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CONSERVATIVE RENAL SURGERY*

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THE term, conservative renal surgery, has taken on a new meaning in recent years. Plastic operations on the renal pelvis and the ureter may become truly radical when they cause long illness, great renal damage or necessitate secondary nephrectomy. Küster made the prediction, many years ago, that plastic operations would become the accepted method of treatment for hydronephrosis. To the present time this prediction has not been fulfilled, and the multitude of surgical procedures used in its treatment serves to indicate in a large measure the lack of general success in the use of plastic renal surgery.

Küster was probably the first to reimplant the sectioned ureter into the renal pelvis as a treatment for ureteral stricture. Fenger first applied the Heineke-Mikulicz principle of gastric surgery to ureteral strictures by incising the stricture longitudinally and suturing the incision transversely. Since these pioneering efforts, many modifications and original procedures have been used. Unfortunately success did not always crown their efforts, and it is my belief that disaster of one degree or another has occurred more frequently than the literature would lead us to believe. Ormond has recently written a paper entitled "Unsuccessful Plastic Operations for Hydronephrosis"; and, aside from its general excellence, it is unique in that it stresses the pitfalls attendant upon plastic renal surgery. The glowing reports of several years ago on plastic renal surgery will not, I believe, present as glowing a picture after the lapse of sufficient time for the declaration of all the surgical dividends.

The cause of pelviectasis is a failure of the renal pelvis to properly empty itself. This may be secondary to an obstruction at the ureteropelvic junction by a fibrosis in or about the ureter, an accessory blood vessel adversely situated with relation to the pelvis and ureter, a neurogenic dysfunction of the pelvis, an incorrect attachment of the ureter to the pelvis or an obstruction within the ureter. The problem of obstructive renal pelvis surgery is a problem of correct drainage. The renal pelvis is a relatively inelastic structure relying to a large extent upon dependent drainage. Any interference with this drainage causes a retention of fluid with its resultant enlargement of the pelvis due partially to

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excretory pressure, but, largely, to the weight of the retained urine. This is especially true of the extra-renal pelvis. Thus the great distortion of a large hydronephrosis shows the ureter attached high on the pelvis in a position making drainage

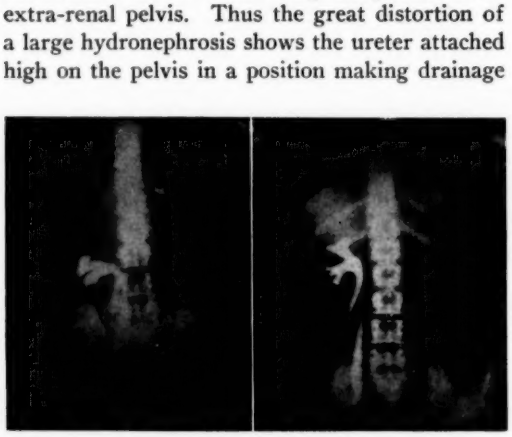

Fig. 1 *(left)*. Retrograde pyelogram of right kidney of forty-eight year old female patient. Complained of severe back and genital pain and recurrent attacks of chills and fever. Renal ptosis, grade 2, with marked ureterectasis.
Fig. 2 *(right)*. Two-months postoperative retrograde pyelogram of same patient. Clinically cured. Operative procedure—nephropexy. Marked improvement in the ureterectasis.

impossible. This non-dependent attachment is a result of the hydronephrosis rather than the cause of it. This is definitely shown in the return of the pelvis to normal or near normal size shortly after the restitution of proper drainage. All of you have seen the prompt reduction in size of a huge hydronephrosis by a properly placed nephrostomy tube. This can be duplicated by any other type of drainage. The important fact is adequate drainage, not the type of drainage. This is a fact that many surgeons have lost sight of in their treatment of hydronephrosis. They have reduced the size of the renal pelvis by resection or by plication, have reimplanted the ureter into the pelvis or have operated upon the uretero-pelvic junction and have neglected the associated or primary cause of the hydronephrosis, e.g., the malposition of the kidney. Many surgeons, on the other hand, have fixed the kidney in a good position in addition to their pelvic surgery but have attributed their good results to the plastic pelvis surgery when it should in a large part, if not entirely, have been attributed to the improved position of the kidney.

Figure 1 shows the pyelogram of a forty-eight year old female patient with renal ptosis of a moderately severe grade having back pains, pain into the genitals and attacks of chills and fever.

Figure 2 shows the same patient two months later. The kidney is held in good position by nephropexy, the calices and pelvis not much changed but the ureter is greatly improved and the patient has no symptoms.

Careful analysis of the good results from plastic operations upon the renal pelvis will show that nephropexy has also been performed in practically all cases. The state of flux which still prevails in renal pelvis surgery is ample evidence of the rather indifferent results the many complicated procedures have had. A few years ago Walters made this statement, "The conservative treatment of hydronephrosis centers around the surgical principle that adequate relief of the obstruction at the uretero-pelvic junction be consummated with a minimal disturbance of renal and ureteral tissue." This becomes increasingly evident to the surgeon as he gains experience in renal surgery. There are, however, many points of renal surgery lost sight of by the individual surgeon in his enthusiasm for a certain type of operation. It is thus most important for the surgeon to first fit his procedure to each case and then to truly evaluate the results on the basis of the procedure or procedures used.

The obstruction of the urinary tract at the bladder neck or at the uretero-vesical junction is a very frequently encountered condition and, while not a part of this paper, must be mentioned because it so frequently complicates the diagnosis. Because unrelieved obstruction anywhere in the urinary tract will ultimately cause ureterectasis, pelviectasis and caliectasis alone or together, the surgeon must be most careful of his diagnosis so as not to operate on a false premise. Careful diagnosis will practically always necessitate retrograde pyelography. Excretory urography alone may be misleading and one may find varying degrees of function even to apparent total non-function of one kidney at one examination only to find an apparently normal functioning kidney at a later examination. When the diagnosis has been made, it is well to reserve judgment as to the exact type of operation to be used until the kidney has been carefully exposed and examined. The final decision as to the procedure to be used must depend upon four factors:

1. The condition of the patient.
2. The condition of the opposite kidney.
3. The condition of the renal parenchyma of the kidney being operated upon.
4. The type of obstruction.

The condition of the patient and of the opposite kidney must both be determined prior to operation through a study of the blood chemistry and the individual kidney functions. Frequently the presence of an excellent kidney on the opposite side may prejudice one to nephrectomy of the involved kidney. This is especially true in the case of an elderly patient unable to stand the financial drain of a long hospitalization and a long convalescence or of an elderly patient in rather poor physical condition. Under such circumstances nephrectomy may be rightly termed the most conservative procedure. In case the kidney is largely destroyed, we are forced to do a nephrectomy unless the opposite kidney is so poor as to demand the saving of all possible renal tissue. Before condemning a kidney as beyond repair, one should remember the tremendous recovery a kidney is capable of making once adequate drainage has been established. A kidney with as little as one-third of its parenchyma intact will recover a life-sustaining function. Two years ago I operated upon a patient with a calculus-obstructed solitary kidney after thirty-six hours of complete anuria. The day following the operation at which the calculus was removed and a nephrostomy performed, the phenolsulphonphthalein excretion was practically nil, the blood urea value was 234 mg. per 100 c.c. of blood and the creatinin value was 9.2 mg. per 100 c.c. of blood. These are usually considered fatal blood chemistry values. In spite of this the patient had only a moderately stormy convalescence and six months later had only slightly elevated blood urea and creatinin values, a phenolsulphonphthalein excretion of over 50 per cent in two hours and was leading an active life. This merely demonstrates what a kidney is capable of doing under the proper conditions of drainage. When the kidney has been exposed and the decision has been made to save it, then the type of procedure will depend upon the type of obstruction present. May I repeat that all good results follow adequate drainage and that, therefore, the simplest method of instituting such drainage must be the method of choice. We must, of course, remove any obstruction which may be present. Frequently, in the case of an aberrant renal blood vessel or a fibrous band of scar tissue, simple excision will suffice. Especially is this true in an early, small hydronephrosis.

Figure 3 is the retrograde pyelogram of a twenty-eight year old female patient with a history of three attacks of severe renal area pain, chills and fever in the past twelve months. Definite obstruction at the uretero-pelvic junction was diagnosed as an aberrant blood vessel prior to operation and was confirmed at operation. Simple excision with nephropexy was performed.

Fig. 3 ***(left)*****. Retrograde pyelogram of left kidney of twenty-eight year old female patient. Three attacks in past year of severe back pain, chills and fever. Pre-operative diagnosis of aberrant blood vessel obstructing uretero-pelvic junction.**
Fig. 4 ***(right)*****. Fourteen-month postoperative retrograde pyelogram of same patient. Clinical cure. Operative procedure—section of aberrant vessel and nephropexy. Great improvement in the caliectasis and pelviectasis.**

Figure 4 is a retrograde pyelogram of the same patient made fourteen months later, showing the tremendous improvement of the kidney. The patient is now completely symptom-free.

In deciding to divide an aberrant blood vessel, one must be certain that the vessel to be severed is not the sole blood supply of a sufficient area to cause necrosis. Obstruction of the vessel for a few minutes will demonstrate, by the change in color of the involved renal tissue, the area supplied by the vessel. The size of this area will determine the procedure to be followed. Hugh Young has said that impairment or serious injury to the kidney produced by ligation of the vessels to the lower pole and the occasionally very imperfect results obtained by ureteral transplantation have brought forcibly to his attention the fact that both of these procedures are far from ideal. He has, therefore, devised an operation in which the pelvis is plicated in such a manner as to draw the ureter away from the aberrant vessel and thus relieve the obstruction. The decision in the presence of large vessels will, of course, vary with the surgeon and must be either this procedure or reimplantation of the ureter. Nephropexy used in conjunction with simple removal of the obstructing mechanism is so simple

as to be almost mandatory. There are many types of nephropexy. One which I described last year is very simple and very efficient in that it permanently fixes the kidney in a high position.

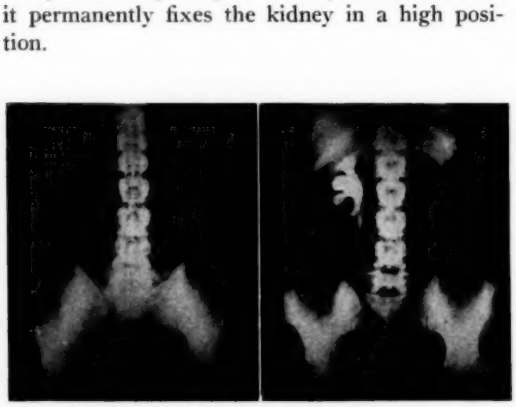

Fig. 5 *(left)*. Retrograde pyelogram of thirty-nine year old patient. Complained of severe back pain relieved on lying down. Renal ptosis, grade 2 plus, with definite caliectasis and ureterectasis.

Fig. 6 *(right)*. Twelve-month postoperative retrograde pyelogram of same patient. Clinical cure. Operative procedure—nephropexy. Marked improvement in caliectasis, especially so in the ureterectasis.

Figures 1, 2 and 5, 6 show the remarkable results simple nephropexy will obtain when no obstructing mechanism is present.

The large hydronephrosis will necessitate a nephrostomy in its treatment. Often in the case of great pelviectasis the uretero-pelvic junction will be attached far up on the pelvic wall. This will frequently influence the surgeon to a pelvic resection or a reimplantation of the ureter; but given a properly fixed kidney, a sufficiently patent uretero-pelvic opening and a well-placed and long-retained nephrostomy tube, and very nearly 100 per cent will drain more perfectly than kidneys that have had reimplanted ureters or a resected pelvis. Should the surgeon feel that the pelvis cannot possibly return to a near normal state without better drainage, then the use of Foley's Y incision and suture of the uretero-pelvic junction will be more efficient than resection and reimplantation of the ureter with its attendant dangers. In all but the most simple cases, nephrostomy is a most important part of the surgical procedure; and in cases involving plastic surgery on the uretero-pelvic junction, it is necessary to use a ureteral catheter as a splint passed into the ureter from above and retained for a long period, as Ormond and Hugh Cabot have recently pointed out.

Obstruction of the ureter may be due to calculus or calculi, to strictures or to fixed kinks. The removal of the calculi is, of course, imperative although associated conditions must also be treated.

Figures 7 and 8 are of a very interesting case. Figure 7 is the ten-minute excretory urogram of a twenty year old girl. She had complained of chills and fever with intense left-sided pain. The left kidney shows marked caliectasis with little or no pelvic or ureteral shadow. The calcified shadows in the lower ureter region are confusing because of the presence of many shadows in the course of the right ureter which with its kidney is normal. A diagnosis of calculi in the lower ureter was made especially as I was unable, because of obstruction, to catheterize the ureter beyond the intravesical portion. At operation the upper shadow was found to be a calculus and was removed. The lower shadow was also a calculus but could not be grasped and removed nor could it be forced into the bladder. The ureter was greatly inflamed and very friable so the wound was closed without removing the lower stone. Eight days later the patient was cystoscoped using a McCarthy panendoscope and the ureteral orifice incised with a Collings knife. The calculus was exposed and flipped into the bladder with the electrode tip. A ureteral catheter was passed to the renal pelvis and left in place two days. An uneventful convalescence occurred. Figure 8 is a retrograde pyelogram eleven months later. The patient is symptom-free, and the pyelogram is quite normal, considering its prior condition.

Strictures of the lower ureter yield themselves very well to dilation. Fixed kinks below the uretero-pelvic junction are rather rare. Liberation of the kinks with nephropexy is usually conducive of good results. Strictures which cannot be dilated must be either incised or excised. Fenger's procedure is moderately successful, although in strictures at the uretero-pelvic junction, Foley's modification of Schwyzer's Y incision will be more satisfactory. Excision of the stricture with resuture using one of several methods of re-establishment of continuity has not been uniformly successful. Von Lichtenberg has never resected a ureteral stricture and repaired it with end-to-end anastomosis because of his fear of later stricture formation. Splinting the ureter with a ureteral catheter drawn through a nephrostomy opening and kept in place an unusually

long time gives the best chance of success and the prevention of secondary stricture formation. In such cases postoperative dilation of the ureter may be necessary.

Uretero-pelvic juncture obstruction requiring surgery is relatively more frequent than ureteral obstructions of similar magnitude. There have been many operations devised for the relief of this obstruction. Many of the originators, as I have stated, ignored the cardinal principles of drainage in their enthusiasm for surgical reconstruction and thus many failures have resulted. Ormond has divided failures into four divisions:

1. Death.
2. Immediate failure of function or immediate complication requiring further treatment, usually nephrectomy.
3. Delayed failure of function necessitating further treatment; again usually nephrectomy.
4. Lack of symptomatic relief.

The causes of failures may be many and varied, but may usually be avoided by proper diagnosis, proper choice of procedure and proper postoperative management. Having performed the plastic procedure upon the renal pelvis, it is well to recognize the fact that dense adhesions will form and that it is, therefore, necessary to prevent ureteral kinking. For this prevention the following procedures are absolutely necessary:

1. Nephrostomy—the correct drainage of the pelvis through the lower portion of the renal cortex with a self-retaining catheter after the method of Cabot and Holland—is greatly superior to pyelostomy.
2. Nephropexy, giving positive fixation in a high position with an unkinked ureter.
3. Adequate perirenal drainage.
4. Splinting of ureter with ureteral catheter drawn out alongside of nephrostomy tube in all cases of reconstruction of the uretero-pelvic junction.

The nephrostomy tube gives perfect drainage and thus promotes shrinkage of the dilated pelvis to a size more closely approaching the normal. It also aids in combating infection by both the improved drainage and by allowing the mechanical flushing of the renal pelvis with antiseptic solution. This reduces the frequency and severity of cortical abscesses, which are one of the great postoperative dangers.

The nephropexy insures the continuance of this adequate drainage through the ureter when

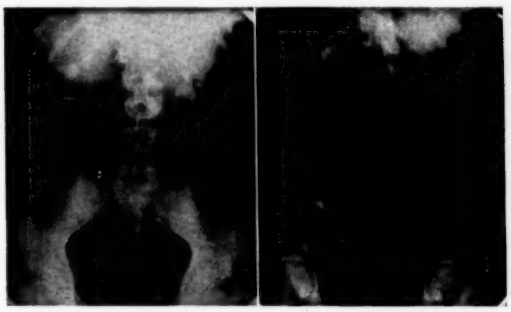

Fig. 7 *(left)*. Ten-minute excretory urogram of twenty year old female patient. Complained of six months' symptoms of pain in left back and side, genital pain, fever, loss of weight. Diagnosis: two calculi in lower left ureter with obstructive hydronephrosis.

Fig. 8 *(right)*. Eleven-month postoperative retrograde pyelogram of same patient. Clinical cure. Operative procedure—removal of calculi. Marked improvement in the caliectasis and pelviectasis with diminution in size of the kidney shadow.

the nephrostomy tube has been removed. Failure to remove the uretero-pelvic junction obstruction will be manifested on removal or clamping of the nephrostomy tube by the symptoms of acute pyelonephritis. This condition necessitates further treatment, usually a reëstablishment of drainage or nephrectomy.

The perirenal drainage is a most necessary procedure because of the frequency, in fact almost constancy, of extravasation of urine about the kidney when the pelvis has been incised. Failure to properly drain may endanger the patient's life and most certainly detract from the beneficial results of the operation. Cabot has mentioned that one of the fundamental precepts of plastic surgery is to prevent scar tissue contracting for three months. After that period it will not contract. He has applied this to plastic work on the uretero-pelvic junction by keeping a ureteral catheter splint in place for a similar period and has succeeded in cases where at a previous operation he failed without this long period of splinting.

There has been a great deal of work done upon the sympathetic nerve supply to the kidney and ureter. Caporale concluded a recent paper with the statement, "Segmentary sympathectomy of the ureter will produce primarily an atony in the tract itself, and secondarily, a gradual peri-

ureteral atony which culminates in a progessive hydro-ureteronephrosis." Sympathectomy also gives the surgeon a temporary false result in that the patient is symptom-free until such times as the increasing hydro-ureteronephrosis, as Caporale names it, becomes of sufficient size or becomes infected sufficiently to cause grave symptoms.

The contentions I have made in this paper were not made to belittle any certain type of operation, but rather to accentuate the need of mature judgment in renal surgery and also in the belief that these contentions are especially applicable to the surgeon of limited experience in renal pelvis surgery. In conclusion, then, conservative renal surgery is dependent upon:

1. Complete and proper diagnosis.
2. Unbiased choice of procedure, determined by individual needs of each case, with the sole idea of instituting proper renal drainage at a minimum of tissue trauma.
3. Nephrostomy in all infected cases, in all large hydronephroses and in all plastic surgery of the renal pelvis.
4. Nephropexy in all cases.
5. Ureteral splinting in all plastic operations of the uretero-pelvic junction and of the ureter proper.

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RADIUM TREATMENT OF RARE FORMS OF LEUKEMIA*

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EVER since the original description of leukemia from the postmortem findings by Bennet and Virchow in 1845 and its clinical recognition by Vogel, a satisfactory method of treating the condition has been anxiously sought. Described as an excessive proliferation of the leukopoietic tissues of the body, either myeloid or lymphoid, with the presence of abnormal leukocytes in the circulating blood, the precise etiology is unknown although the condition may follow malaria or severe pyogenic infection. Certain of the lower animals, such as dogs, horses, cattle and chickens, are susceptible.

Before the advent of irradiation, a large number of remedies were tried. Most of them were toxic and dangerous and few afforded much palliation. Iron and arsenic have been given to combat the anemia, and benzol, quinine, tuberculin, and nuclein have been used to reduce the excessive number of leukocytes. Splenectomy has also been carried out.

These measures were empirical, however, as the true cause of the disease, as has been said, awaits discovery. Hence the therapeutic search has been for methods to afford palliation and relief from the distressing symptoms. In fact, to this day, no palliative treatment has been found for the occasional acute forms of myelogenous or lymphatic leukemia; the disease runs the rapid course of a fulminating overwhelming infection and the outcome is fatal.

In 1903, Nicholas Senn[5] reported gratifying results in the treatment of a patient with chronic myelogenous leukemia by roentgen rays. Rénon, Degrais and Desbouis[4] used radium therapy, and in 1913 reported five cases in which patients were treated by this method. One of the earlier reports in this country (1917) was by Giffin,[2] who reported thirty cases in which radium treatment was employed.

Since this early work, roentgen and radium

*From the Section on Therapeutic Radiology and Division of Medicine, The Mayo Clinic, Rochester, Minn. Read before the annual meeting of the American Therapeutic Society, Atlantic City, New Jersey, June 4-5, 1937.

TABLE I. RADIUM TREATMENT OF RARE FORMS OF LEUKEMIA
Symptoms, diagnosis and results

Case	Age, years, and sex	Admitted	Diagnosis	Symptoms	Results
1	41 F	4-18-35	Subleukemic splenic reticulo-endotheliosis	Nosebleeds (6 mos.). Mass ULQ (6 wks.). Tired easily (2 mos.)	Dismissed 12-10-36. Good general condition
2	50 M	4-25-35	Chronic leukopenic myelogenous leukemia	Swelling left abdomen (3 mos.). Shortness of breath after meals	Fair palliation. Returned 2-37 with enlarged spleen. Condition fair
3	46 F	5-20-35	Subleukemic splenic reticulo-endotheliosis	Tired, weak (5 years.). Enlarged spleen (2 yrs.). Anemia. Spleen 3*	Excellent response and palliation to date
4	49 F	7- 8-36	Chronic leukopenic myelogenous leukemia	Mass ULQ (3 mos.). Discomfort	Much palliation. Improved blood count. Seen 12-4-36, no treatment needed
5	57 F	11-23-36	Subacute lymphatic leukemia	Weak, tired, short of breath, edema of ankles (4 mos.). Spleen 3+,* general glandular enlargement	Remarkable remission. Count practically normal. Dismissed 12-18-36
6	37 M	1- 6-36	Subacute lymphatic leukemia	Weakness, dyspnea (2 yrs.). Spleen 3+*	Spleen reduced, WBC 7,800. Dismissed 1-16-36
7	70 M	6- 4-36	Chronic leukopenic myelogenous leukemia	Anemia (5 to 6 yrs.). Weak, short of breath, lost weight (1 yr.). Spleen 3*	Letter (9-2-36):"Reached home comfortably"
8	47 M	5- 7-36	Chronic leukopenic myelogenous leukemia	Chills, fever, cough, "flu," vertigo, pain in bones (6 mos.). Spleen 3*	Spleen softened and reduced
9	39 M	10-22-36	Acute leukemic reticulo-endotheliosis	Acute tonsilitis. Acute cerv. adenitis (4 wks.); became generalized	Course rapidly downhill. Dismissed 10-29-36. Died 11-1-36
10	61 M	6-18-36	Monocytic leukemia, Naegeli type, subacute	Weakness, loss of weight, inability to work (6 mos.)	Dismissed November, 1936; several transfusions elsewhere
11	58 M	11- 2-35	Subleukemic splenic reticulo-endotheliosis	Splenomegaly, petechiae, asthenia following erysipelas	Dismissed 11-20-35, 3-26-36: patient up and around, much improved
12	40 F	6-24-35	Chronic myelogenous leukemia, leukopenic type	Pain and swelling of joints (1 yr.). Vertigo and weakness (7 mos.)	Re-examined 3-4-36. Much better. Arthritis improved
13	3 M	11- 2-36	Leukemic reticulo-endotheliosis	Age 5 mos.: extensive skin infiltration, WBC 300,000, spleen 3.* On admission: swelling right eye, spleen palpable, general glandular involvement	Improved. Letter (12-8-36): doing well, residual pain in ankle and knee joints
14	33 M	3-26-34	Chronic myelogenous leukemia (leukopenic type), low grade	Spring 1933, operated on for appendicitis and cholecystitis. Spleen 2.* Diarrhea and bleeding rectum (8 mos.)	Letter (11-13-36): Much better spleen smaller
15	61 M	11- 5-35	Leukemic reticulo-endotheliosis	Short of breath, weak (1 mo.)	Indeterminate
16	64 M	6-21-35	Chronic leukopenic myelogenous leukemia	Weakness (2 yrs.). Mass abdomen (6 mos.). Dizziness, pallor and dyspnea	Good palliation. Dismissed 4-14-36. Died 8-7-36

*Grade of enlargement.

TABLE II. RADIUM TREATMENT OF RARE FORMS OF LEUKEMIA
Treatment and blood count

	TREATMENT					BLOOD COUNT									
		Radium*								Cells, Per Cent					
Case	X-ray date of †	Date	Blocks	Hours each	Total Mc. hours	Date	Leukocytes, thousands	Erythrocytes, millions	Hemoglobin, per cent	Lymphocytes	Polymorphonuclears	Monocytes	Reticular cells‡	Immature myeloid cells	Stem cells
1	4-27-35	8- 7-35	1	8	1200	4-19-35	31.1	3.8	73	84	11.5	3.5			
		12-30-35	2	10	2200	6-18-35	5.4			58.5	27.5		13.0		
				12											
		6-19-36	1	10	2500										
2	4-27-35	9- 5-35	1	12	2400	4-25-35	19.6	4.06	83	18	53.0	3.0		8.0	1.5
		4-14-36	1	12	1200	9- 5-35	3.7								
	6-27-35	11-10-36	1	12	1200										
		2-14-37	1	12	2400										
3	6-17-35	12-30-35	1	10	1500	5-20-35	10.5	2.84	50	45.5	4.5		49		
		5-12-36	1	10	1000	11-16-36	2.9	4.04		32.5	24.5		36.0		
		12-14-36	1	12	1200										
4		7-13-36	8	10	4000	7- 8-36	10.1	3.78	84	18.5	74.5	2.0		2.5	0.5
						12- 3-36	18.3	3.6	77	9.5	81.5	5.0		0.5	0.5
5		12-10-36	3	12	1800	11-23-36	7.8	1.96	43.8						
		3 transfusions				12-12-36	5.5		Smears suggest chronic lymphatic leukemia						
6		1- 8-36	4	14	2800	1- 7-36	13.6	3.96	57	43.5	20				
									Immature lymphocytes				34.0		
7	Elsewhere Feb. 1936	6-13-36	2	8		6- 4-36	1.15	1.65	40						
		12 transfusions	6	10	3800	8- 5-36	3.7	3.24		"Myeloid immaturity to stem cells"					

8		5-15-36 6-30-36	2 5	12 12	1200 3000	5- 8-36	6.1	3.96	78	13.0	67.5	11.5		4.0	0.5
9		10-27-36	1	12	600	10-23-36 10-28-36	39.2 108.0	3.14 2.11	70						
10		6-22-36	4	10	2000	6-18-36	7.5	3.48	59	23	25.5 Metamyel Promyeloc	29.5 ocytes ytes		3.5 3.5 6.0	3.5
11		11-13-35 5 trans- fusions	2	10	1000	11- 4-35 11-20-36	3.0 3			77.5	18.5	3.5			
12	7- 2-35	7-10-35	5	10	2500	6-21-35 7-13-35 3- 4-36	7.8 5.6 7.8			24 16.5 25.5	53.5 68 59	17 13 12.5		0.5 1.0	
13	At 5 mos. elsewhere. Elsewhere 6 mos. prev. adm.	11- 3-36	19	12	11,400	11- 2-36	6.1	3.53	68	58.5	32.5	3.5			
14		7-21-36	2 4	10 10	3000	3-27-34	7.5	4.4	83	25.5	68	3.0		0.5	
15		11-14-35	1	10	500	11- 6-35	10.1	3.94 Neutro. Eosino. Basophils	68	48.5 29.5 5.0 4.5		5.0	3.0	4.5	
16		6-25-35 9-15-35 4-14-36	6 3 9	8 8 8	2400 1200 3600	6-22-35 9-19-35	5.9 3.9	3.6 Neutrophils Basophils	50	34.0 57.0 0.5		2.0		6.5	1.0

*To spleen (case 9, neck only; case 13, spleen and all glands).
†Moderate voltage.
‡Reticular cells = reticular endothelial cells. Not to be confused with reticulated erythrocytes.

therapy have been universally accepted as the preferable form of treatment for chronic myeloid or lymphatic leukemia. The beneficial effect, however, has been entirely in the realm of palliation. Exact evaluation of this is difficult because of the natural spontaneous remissions which occur in a very small percentage of cases in which patients are untreated. We have observed no permanent cures following irradiation. One of us (Fricke[1]) reported the results of the radium treatment of 157 patients with leukemia and found no prolongation of life of those treated as contrasted with those who were not treated; the palliation secured, however, was definite and impressive. In nearly all cases the symptoms disappeared completely and the patients were able to resume their normal activities for months at a time.

Typical leukemia is a relatively infrequent disease, Barker having said that there were only one or two leukemic patients in every thousand admissions in general hospital practice. The disease occurs at any age, although it is more frequent in middle life. Males are more often affected than females. The chronic forms of the disease are, fortunately, more common than the acute forms, and chronic myelogenous leukemia is more frequently seen than lymphatic leukemia. Irradiation affords slightly more pronounced palliation in cases of chronic myelogenous leukemia.

In this study we are considering the more unusual or borderline types of this rare disease, and these demand, for their detection, a careful study of the history, physical examination, blood studies, and particularly, care in the recognition of immature blood cells. Many of these aleukemic or leukopenic types of leukemia present as their initial symptom, anemia with a leukocyte count within normal limits or even low, which, in association with splenomegaly, may be confused with splenic anemia or Banti's syndrome. Many times purpuric manifestations will appear relatively early in the disease, and in the presence of an unexplained anemia with purpuric manifestations and a normal leukocyte count, one should make a thorough search for immature cells in the blood. One of us (Watkins[6]) has called attention to the differential diagnosis of these conditions. In our experience these atypical leukemias have frequently been confused with Banti's syndrome and agranulocytosis.

If the incidence of ordinary leukemia is one or two in every thousand general hospital admissions, there will be found one or two of these borderline types to every hundred cases of leukemia. The diagnosis of these rarer types is improving and more cases are being reported each year. These unusual types of leukemia may be classed as aleukemic phases of myelogenous, lymphatic, monocytic or leukemic reticulo-endotheliosis.

One type of particular interest is subleukemic splenic reticulo-endotheliosis, which was described by Giffin and Watkins[3] in 1934. In the two cases reported at that time, splenectomy was performed, with only temporary improvement in the patients' condition. Since then six other cases of this type have been recognized and the patients treated by radium, with quite satisfactory results. The longest duration of life to date, in this group of patients treated by radium, has been two years, and the patients have remained in very good condition. It seems that, in most of these cases, radium decreases the size of the spleen, enables the patient to maintain a more nearly normal leukocyte count, and reduces the number of immature cells in the blood. It is not the purpose of this paper, however, to discuss in detail the diagnosis of the condition except to say that it is finally established by the finding of monocytes showing characteristics of reticular origin in the circulating blood. For detailed discussion, one is referred to the article just mentioned.

During 1935 and 1936 we have treated, with radium, sixteen patients with these atypical leukemias (Tables I and II). Of these sixteen patients, ten were males and six females. They ranged in age from three to seventy years, the average age being forty-seven. Eight patients were diagnosed as having aleukemic phases of chronic myelogenous or lymphatic leukemia (in only two of these eight cases was it of the lymphatic type). One patient had a monocytic leukemia of the Naegeli type, and seven, types of reticulo-endotheliosis. We believe that once the diagnosis is established in these obscure cases with low leukocyte counts, radium is the treatment of choice in order to obtain satisfactory palliation. Roentgen therapy covers a larg-

er portal and the effect of treatment is usually too sudden and drastic. Our best results have been obtained by the very cautious and well-controlled use of radium.

At a distance of 1 inch (2.5 cm.) from the skin, 50 mg. of radium sulphate (element), filtered through 2 mm. of lead, was applied for a period of eight to twelve hours, depending on the leukocyte count, the size of the spleen and the general condition of the patient. In addition to daily blood counts, blood smears were studied in detail and the amount of destruction of immature cells was noted. Should there be evidence of a decrease in the leukocyte count or an increase in the degree of anemia, radium treatment is stopped for a while until the blood count returns to its previous level. It is quite the rule that in most of these cases of low leukocyte count there is an increase in the erythrocyte count following treatment with radium. The anemia is practically corrected within a relatively short time and the immature cells of the leukocytes series are gradually eliminated. The differential count usually approaches a more nearly normal level.

The patients were then sent home for three or four months. Treatments varied from one to nine areas over the spleen in one treatment series, and from eight to twelve hours of treatment per area, all carefully controlled by blood counts.

Fifteen of the sixteen patients showed improvement in the condition of their blood and amelioration in their symptoms (Table I). The one exception was a man, aged thirty-nine years, who suffered from an acute reticulo-endotheliosis following a severe attack of acute tonsillitis four weeks previously. Radium treatment was begun, but was abandoned after twelve hours, as the patient was failing rapidly. He died two days later. Too little treatment was applied to have affected the disease one way or another.

Summary and Conclusions

The ability to recognize immature cells is the first requisite in establishing the diagnosis of these rare forms of leukemia. These cases are seldom seen, but they are important and better diagnosis will increase the number that are recognized.

In the differential diagnosis many diseases have to be ruled out, such as aplastic anemia, purpura hemorrhagica, agranulocytosis, Banti's syndrome and hemolytic jaundice. In these conditions, irradiation is not only contraindicated but likely to prove decidedly injurious.

In the treatment of these rare types of leukemia, splenectomy, which has been occasionally performed, does not help. Roentgen therapy, often covering portals which are too large and including too much of the blood-forming apparatus, is too drastic and may prove harmful. The best therapeutic agent seems to be cautious, limited radium treatment. It has, in our experience, proved of great value in producing effectual palliation.

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TUBERCULOUS INFECTION AND MORBIDITY AMONG MEDICAL STUDENTS AND PHYSICIANS*

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TUBERCULOSIS is still so prevalent a disease that it is encountered by every physician and medical student whether he is aware of the contact or not. Whether this contact can be considered an occupational hazard is a question that has been of great interest to us at Glen Lake Sanatorium because medical students from the University of Minnesota come here for their instruction in tuberculosis. In examining these students upon entrance, we were at first chiefly interested in the study of pathological lesions of tuberculous origin and their clinical activity, but more recently we have included the study of tuberculous infection.

Infection

Fourth year medical students have each spent two weeks as clinical clerks in this sanatorium since 1925. In 1929, we first began to question them in regard to tuberculin tests† given them before they came to us. We found that of the first eighty-seven students questioned, fifty-seven (65 per cent) had reacted positively when tested at the Students' Health Service at the University to 1:1000 dilution of old tuberculin. We felt, however, that more exact information could be obtained if we tested all students the day they came to the Sanatorium. Therefore, beginning in the middle of November, 1930, the next 184 students were tested and 122 (66.3 per cent) were found to be positive to the intradermic test.

Because our percentages in these two groups were so close, we decided in June, 1932, to question the students and test only those who gave a history of not reacting to tuberculin. We felt this method would give us very satisfactory results because the medical students of the University of Minnesota have been made intelligently aware of the importance of present day methods of detection, prevention and treatment of tuberculous disease through the interest in this subject of Dr. J. A. Myers and Dr. H. S. Diehl. Our findings by the year are shown in Table I.

TABLE I. THE INCIDENCE OF POSITIVE AND NEGATIVE TUBERCULIN REACTIONS

(Among students entering the Sanatorium for study)

Year	Negative	Positive	Questionable or no Record	Per Cent Positive
1930	36	80	4	66.6
1931	38	71	1	64.5
1932	53	90	–	62.9
1933	56	64	2	52.5
1934	39	85	2	67.4
1935	55	62	1	52.5
1936	36	76	–	67.8
	313	528	10	62.04

It will be noted from this table that the range of positive reactors to tuberculin varies for the different years from 52.5 to 67.8 per cent. The average of 62.04 per cent among our 851 fourth year medical students is less than that reported among fourth year medical students in the eastern part of the country. At the University of Pennsylvania,[3] it was found that the number of positive reactors among their medical students increased in each year of the course until in their fourth year 98 per cent of them reacted positively. It was observed that this steady increase in the number of reactors (noticed also at Yale) is not necessarily confined to medical schools, but is probably true of any school where the students' opportunities for infection must increase with continued residence among a large

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†These students had for the most part been examined at the Students' Health Service within a year prior to coming to the Sanatorium and all students who had been negative to tuberculin at this Health Service examination were re-tested. Old tuberculin was the substance used at the University. At Glen Lake, we used from November, 1930, to March, 1932, Dorset's Old Tuberculin, .01 mg. on one arm and MA 100 Human Tuberculin .0005 mg. on the other arm. Those who reacted negatively to the above doses were given a double dose of MA 100. Beginning in March of 1932, only MA 100 Tuberculin was given until December, 1934, when PPD was started and we have continued to use the latter to date. When we first started using PPD, we used both strengths, but during the past year only the second strength (0.005 mg.) has been given.

group of people. Similarly, 91 per cent of the fourth year students at Johns Hopkins[2] had positive reactions, as did 94.1 per cent among the three upper classes in medical school at Yale.[6] It is probable that the lower incidence among our students as compared with that of these other schools lies in the fact that our sudents, for the most part, come from communities less densely settled than do the students attending eastern schools. This lower incidence of tuberculous infection among college students (mostly non-medical) in the Middle West has recently been observed by Long and Seibert,[4] who also think that the above explanation is the most logical.

Morbidity

The incidence of morbidity among medical students is of equal or greater interest than that of infection. In an effort to obtain facts about the morbidity among our fourth year medical students when they came to the sanatorium, as well as subsequent to their stay here, the following data were accumulated.

Since 1920, medical students from the University of Minnesota have been coming to Glen Lake Sanatorium, an institution caring for 700 patients, for their instruction in the treatment of tuberculosis. Until about 1923, the period of study equalled three months. This time was gradually shortened until it was set at two weeks in 1925. Since then, all the members of each fourth year class have been in residence here for two-week periods of instruction. Their work has consisted of taking histories, making physical examinations, and in helping with various forms of treatment both in the wards and in the treatment rooms. In short, they have been in contact with tuberculous patients during those two weeks to the same degree as have the resident sanatorium physicians.

The possibility of tuberculous disease was taken into consideration from the first, and x-ray films were made of the students' chests the day they started work at the sanatorium. The present study is a review of those films in connection with a questionnaire sent to the former students. The period here covered is the first ten years of this plan, extending from 1920 to September 15, 1930. To the 670 in this group who had been here for training at some time during the ten years, questionnaires were sent early in 1932 in an attempt to ascertain the state of their health during the interval between receipt of this questionnaire and their sanatorium residence. Replies were received from 526, or 78.6 per cent of the group.

These replies have been classified into two main groups: the normal and the abnormal, depending upon the interpretations of the chest x-rays taken when these people first came to the sanatorium. The normal group, numbering 473, consisted of those whose interpretations were described as any of the following: normal chest, increased bronchial markings, slight thickening of the pleura. The abnormal group consisted of those whose interpretations might constitute possible evidence of tuberculosis or tuberculous infection, such as definite infiltration, primary complex, fibrosis of the parenchyma. There were fifty-three in the latter group.

Normal Group

267 had no subsequent x-rays
206 had subsequent x-rays

473 total

The replies to the questionnaire disclosed that 267 of the normal group of 473 had considered themselves in good condition and had not troubled to have subsequent x-rays of their chests. Of the 206 who had had subsequent x-rays, 168 still had normal readings. Thirty others reported abnormal findings consisting of evidence of acute or chronic non-tuberculous conditions variously diagnosed as bronchitis, bronchiectasis, emphysema, et cetera, but no evidence of adult tuberculosis. Briefly there were 465 of this group who had shown no subsequent evidence of tuberculous disease.

The remaining eight in this group whose roentgen findings were considered normal when they were here as students subsequently showed lesions of pulmonary tuberculosis. In two of them, the disease was diagnosed as far advanced, in two others moderately advanced, and in three as minimal. The one remaining case was classed as questionable. Their lesions had all appeared in from one to four years after their training at the sanatorium, but it must be remembered that during that interval they were practicing their profession and had come in contact with all types of patients. Five of these physicians reported at the time of the questionnaire that they were

working and a sixth reported that he expected to return to work in a short time.

Abnormal Group

39 had subsequent x-rays
14 had no subsequent x-rays

53 total

Ten per cent (fifty-three) of the students who came to the sanatorium showed deviations from the normal that might constitute possible evidence of tuberculosis when their chests were first examined. The answers to the questionnaire that was sent to these students one to ten years after their period of instruction at the sanatorium showed that thirty-nine had had subsequent x-ray examinations. This group of thirty-nine is divided as follows: thirty-three who had shown no clinical evidence of tuberculosis and six who had shown definite evidence of clinical tuberculuosis when they were in residence here. Considering the thirty-three, we find that twenty of them reported that their lesions had shown no change from the examinations made at the sanatorium. Their lesions were divided as follows: two with Ghon tubercles; seventeen with fibroid lesions (six bilateral and eleven unilateral); one with unilateral artificial pneumothorax. Ten of the thirty-three had had subsequent roentgenograms of the chest that had been interpreted as normal. In reviewing the films taken when these ten first came to the sanatorium, we found that eight of them at that time had shown a slight fibroid change in one or both apices and two of them had shown primary complexes. In the three remaining cases of the thirty-three, one showed definite improvement in a bilateral lesion and the two others reported slight fibroid lesions on the opposite side from those found while at the sanatorium.

There were six cases in this abnormal group who had shown specific evidence of tuberculosis when they came to the sanatorium as students. Five of the six had shown definite roentgen changes in the chest. Four of the five had had definite physical findings when first examined. Because of the extent of their disease, two of this group were advised to stop their courses and take up treatment when first seen. The advice was not followed. Four of these five have since shown extension of their lesions and two of them have spent some time in a sanatorium as patients. The fifth case reports malaise but no extension of his lesion and he has never given up work. Four of the five were working when the questionnaires were returned. The sixth one, who showed clinical evidence of tuberculosis and was therefore put in this group, had a normal chest x-ray when he came here for instruction, and this has remained normal to date. However, tuberculosis of the kidney was first definitely diagnosed when he came here as a student, and careful history revealed that it dated back for a period of about two years. The kidney has since been removed and he is now well and working.

We reviewed the films that were made at this institution of the fourteen doctors in this abnormal group who had had no subsequent films taken and found that ten had slight fibroid lesions (seven unilateral and three bilateral) when they came here as students, and four others had shown Ghon tubercles. Forty-seven of the fifty-three students in this group had shown no evidence of clinical tuberculosis subsequent to their graduation.

We were disappointed in that our questionnaire did not aid us in the question of infection as well as in the problem of morbidity. We found that so few of the doctors had had tuberculin tests after they were graduated that the results were of no material value. It is of interest to note that of the approximate 100 who had had tuberculin tests since leaving the sanatorium, 23 per cent were still negative.

After reviewing the literature of morbidity of tuberculosis, Herman, Baetjer, and Doull[2] stated that in their opinion the proportion of symptomatic tuberculosis in males in the general population between the ages of twenty and twenty-nine years is probably not lower than one or higher than three per cent. Our study of a similar age group (23 to 29) brings out that fourteen students out of a total of 526, or 2.6 per cent, showed definite evidence of tuberculosis. Six showed evidence of advanced tuberculosis when first seen and eight developed tuberculosis from two to twelve years after graduation. Steidl,[7] who in 1932 followed medical students in a manner similar to ours, found that 2.5 per cent of the Harvard medical students developed tuberculosis; about half of these developed the disease before graduation, and in a similar follow-up study on the law students found that 2.08 per cent developed tuberculosis. The incidence of

pulmonary tuberculosis in various schools in the University of Michigan from 1917 to 1930 is cited by Herman, Baetjer and Doull,[2] who think that from a statistical point of view the incidence of 2.81 per 1,000 student years found in the medical school is not significantly different from that found in literature, law, engineering and the various other schools in the same university. These figures all compare favorably with ours and do not suggest that the possibilities of developing clinical tuberculosis are greatly increased by a training in a tuberculosis sanatorium as might be inferred from an article by Myers.[5]

Mortality

At the conclusion of this study, there had been no deaths from tuberculosis among the 526 who trained here. Tuberculosis has never caused a proportionately large number of deaths among physicians. Emerson and Hughes[1] found that the tuberculosis death rate among physicians was 39.5 per 100,000 as compared with 133.5 among all white males in the United States. I believe that it is safe to assume that physicians have always been more or less exposed to tuberculosis, but statistics do not show a high death rate among them, which seems to support the assumption that there is a relatively low morbidity rate.

This study reveals: (1) That 62.04 per cent of our fourth year medical students have been infected with tubercle bacilli prior to coming into known contact with tuberculous patients; (2) that the morbidity over a one to ten year period was 2.6 per cent; (3) that there were no deaths among the 526 students who had been here for a period of study. It does not suggest that tuberculosis can be considered an occupation hazard for medical students and doctors.

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CLINICAL NOTES ON THE RESULTS OF FEVER THERAPY*

Report of the First International Conference on Fever Therapy New York City, March 29-31, 1937

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ON MARCH 29, 1937, a group of approximately 250 physicians, including representatives from twenty-nine foreign countries, gathered together at Columbia University Medical School to discuss the present status of fever therapy. During the ensuing three days approximately sixty papers on various phases of fever therapy were presented.

In opening the session, Whipple, of New York, expressed the opinion that fever therapy, although young, still had had an astonishing growth, that hazards might be connected with this remarkable growth, but that he was certain fever therapy had established "new standards in medicine." In reply, Abrami, of Paris, who was Chairman of the French Delegation, extended felicitations and reviewed the early developments in the field with special reference to the original work of Wagner-Jauregg on malaria. A message from D'Arsonval, of Paris, described his early studies on electric heating of the human body that led to the development of physical devices for producing fever. He stated he was proud to have written in 1882 "that the therapeutics of the future will employ as a curative means the physical modificators, heat, light, electricity, and other agents still unknown."

A message was also sent to the Congress by Wagner-Jauregg, of Vienna. He stated that he started his first attempts to treat diseases by means of artificial fever in 1891, when he used injections of tuberculin in the treatment of mental diseases. Since 1900, his studies have been primarily concerned with the treatment of gen-

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eral paralysis of the insane. He expressed the opinion that high temperatures, per se, do not produce the beneficial effects in dementia paralytica and he urged that malarial therapy always be combined with chemotherapy in the treatment of this disease. He concluded: "It should not be the aim of these combined therapeutic methods to destroy the pathogenic organism in the human body, but to improve the resistance of the organism and tissues against the pathogenic agents."

Abrami compared the effects produced by the two distinctly different methods of production of artificial fever (injections of foreign proteins and production by physical means). He felt that it was remarkable that two methods so different in nature could produce similar therapeutic results. He felt that physically induced fevers had the advantage of less danger "owing to the fact that the temperature can be controlled and measured accurately."

Richet, of Paris, like Abrami, compared the two chief forms of production of fever. Fevers produced by inoculations with infectious organisms or injections of foreign proteins he called "active fevers" while those produced by various physical means he termed "passive fevers." He felt that the effects were not entirely the same.

Hardy, of New York, studied the mechanism of heat loss from the human body in a calorimeter and concluded that "the mechanism for heat loss is adequate to care for twelve times the basal heat production" and that "spontaneous fever is due almost entirely to malfunction of the mechanism for heat loss."

Halphen and Auclair, of Paris, reported on the treatment of 3,000 patients suffering from various diseases. They produced fever by means of short radio waves and expressed the opinion that "it is regrettable that the American authors should have abandoned short waves in fever treatment without having drawn from it all that it could give." They suggested that the technic which they had developed would prove ideal for the production of fever.

Binet, of Paris, and Gernez of Lille, in studies on the physiology of fever, found great modifications in the antibodies of normal and syphilitic individuals following fever.

Gibson, Kopp and Evans, of Boston, studied the changes in plasma and total blood volume during the course of fever treatment. They concluded that fever unaccompanied by sweating does not, in itself, bring about any considerable changes in blood volume but that when fever is accompanied by profuse perspiration, the reduction in blood plasma may be so great as to produce peripheral vascular collapse. Absorption of fluid from the intestinal tract may be retarded during high fever but intravenous administration of fluids permits rapid restoration of blood volume.

Pijoan, Kopp and Gibson, of Boston, studied the acid-base balance during therapeutic fever and concluded that fever characterized by severe dehydration and hyperventilation brought about a pronounced alkalosis; the degree of alkalosis, which approached critical levels, is dependent primarily on the severity of the dehydration and secondarily on the extent of hyperventilation.

Warren, of Rochester, New York, in seven cases noted the development of jaundice following prolonged fever therapy. He found two significant facts common to each case: (1) the rise in icteric index was accompanied by low value for the serum chloride and diminished excretion of urinary chlorides, and (2) the jaundice was relieved *only* by the administration of large amounts of sodium chloride (as much as 20 gm. in twenty-four hours) and not by the administration of carbohydrates. Proper attention to chloride and water balance "is apparently the most important factor in the technic of administering prolonged fevers."

Doan, of Columbus, Ohio, in an exhaustive study of the differential reaction of bone marrow, connective tissue and lymph nodes to hyperpyrexia, concluded that "hyperthermia by physical means not only provides the thermal factor of importance for the inactivation of the treponema pallidum and the gonococcus but has now been demonstrated to exert a profound effect on the cellular equilibria of the body in the directions which we believe at the present time to be the most effective in the mobilization of the defense forces of the body against these diseases."

Hartman, of Detroit, pointed out that untoward results of fever therapy are "always preceded by cyanosis and vascular collapse" and that it seems justifiable to place anoxemia as the

underlying cause of the lesions found at necropsy following deaths from fever therapy.

Ebaugh, Barnacle and Ewalt, of Denver, concluded that most delirium, seen during fever therapy, could be handled by simple psychotherapeutic and physical procedures. They felt that the administration of sedatives contributed largely to the production of delirious episodes. They concluded that schizophrenia was not benefited by fever therapy. They reported on eighty-seven cases of general paresis; 71 per cent of the patients who were treated with combined physical fever and tryparsamide were benefited while 58 per cent of those who were treated with malarial therapy likewise were helped. As to the cerebrospinal fluid, 52 per cent of the patients who were treated with physical fever and tryparsamide were improved or reversed while 39.5 per cent of those who were treated with malarial fever were affected in the same manner.

Dowdy and Hartman, of Detroit, found that in fever therapy carbamide sedatives were more satisfactory for basic sedation than the barbituric acid group of drugs. They also recommended the prescribing of a high carbohydrate meal on the night before fever treatment and the intravenous injection of 500 c.c. of 10 per cent solution of dextrose in physiologic saline solution on the morning of treatment.

Pamboukis, of Athens, Greece, proposed the use of dengue fever as a therapeutic agent.

Simmons and Dunn, of Omaha, Nebraska, reported fifteen cases of acute rheumatic fever in which fever therapy was employed. Thirteen patients obtained complete relief of pain and swelling of the joints; two patients had relapses within two weeks to two months and one patient had a recurrence of chorea twenty-one months after treatment. In many of the cases, leukocyte counts and sedimentation times became normal after fever therapy.

Osborne, Blatt and Neymann, of Chicago, treated twenty-five children, who had chorea, by means of electropyrexia. Choreiform movements ceased in 88 per cent of the cases. The presence of rheumatic carditis did not preclude the use of fever therapy.

Sutton and Dodge, of New York, reported on the treatment of more than 400 attacks of chorea by means of fever therapy. Sixteen patients who had associated rheumatic carditis were all benefited. A comparative analysis of ninety-five cases in which fever therapy was used and seventy-five cases in which fever therapy was not used showed a definitely lower incidence of rheumatic manifestations in the cases in which fever therapy was used. Fever therapy was capable of cutting short an attack of chorea; the presence of active carditis was not a contraindication to its use but carditis was perhaps benefited by it. Barnacle, Ewalt and Ebaugh, of Denver, during a two-year study, treated forty-five patients who had chorea. Immediate results were excellent and recovery occurred in the majority of cases. There were three recurrences. The incidence of carditis was 42 per cent (nineteen cases). Its presence did not interfere with treatment and two-thirds of the patients who had carditis showed at least an improvement in cardiac function.

Alajouanine and Maruiac, of Paris, concluded that in neurologic practice fever therapy was most beneficial in the treatment of syphilitic disease of the nervous system.

Claude and Rubenovitch, of Paris, advised malarial inoculations followed by prolonged chemotherapy in most cases of general paralysis. They suggested that electropyrexia should be preferred in cases in which Wassermann-fast reactions were present, in cases in which malarial therapy was either contraindicated or had failed, and finally, to reinforce the effect of postmalarial chemotherapy.

Bennett and Cash, of Omaha, Nebraska, recommended fevers at low temperatures as a safe and efficient means of treating neuritic and radicular pains. Hambresin, of Brussels, recommended fever therapy particularly in the treatment of syphilitic optic atrophy as well as in keratitis, iritis and iridocyclitis.

McGavic, of Cincinnati, reported on forty-two cases in which various ocular diseases were treated with fever therapy. Best results were obtained in syphilitic interstitial keratitis while good results also were obtained in gonorrheal ophthalmia and syphilitic iridocyclitis.

Moench, of New York, found that at temperatures ranging from 40° to 42° C. all strains of the meningococcus studied, except one, showed reduction of growth within five to seven hours. Five strains were either destroyed or greatly reduced in five hours or less. She concluded

that fever therapy seems worthy of trial in selected cases of meningococcic infection.

Lardennois, of Paris, thought that fever therapy might benefit localized acute infections.

Major, Doub, and Hartman, of Detroit, studied the effect of fever therapy upon dogs which had been subjected to experimental tuberculosis. Temporary improvement was noted and, as compared with control dogs, life was prolonged.

Jares, of Rochester, New York, studied the thermal death time of animal tumor cells in vitro. He concluded that the combined effects of fever and roentgen rays are superior to the effect of either alone. The most destructive combination was simple fractional roentgen ray dosage (about 300 r. daily) plus heat treatment immediately afterward. Stecher and Solomon, of Cleveland, reported that of twenty patients who had acute nonspecific infectious arthritis, twelve obtained prompt relief and apparent cure while eight were partially relieved.

Walthard, of Geneva, Switzerland, observed the effect of short wave fever therapy in twelve cases of multiple sclerosis. He noted temporary diminution of spastic symptoms during and after treatment. The spasticity reappeared in all cases three or four months after treatment.

Russell, of London, reported fifteen cases in which disseminated sclerosis was treated by fever therapy. In four cases the gait became worse, in five cases there was no change and in six cases there was improvement.

Schroeder, of Copenhagen, recommended the use of intramuscular injections of 0.5 to 2 per cent sulphurated oil as a fever-creating agent.

Bessemans, of Ghent, Belgium, concluded that the best antisyphilitic hyperthermic methods are those which present all the sites of infection for the longest possible time to the highest possible temperature.

Hinsie and Blalock, of New York, reported the results of a twelve-year serologic study of general paralysis. They treated patients by four methods: (1) malarial therapy alone, (2) malarial therapy plus chemotherapy, (3) physical fever alone, and (4) physical fever plus chemotherapy. They concluded that physical fever plus chemotherapy gave the best results in their series of 326 cases. Ten years after treatment the Wassermann reaction on the serum was negative in 75 per cent of twenty-eight cases; in 89.3 per cent of twenty-eight cases the Wassermann reaction on the cerebrospinal fluid was negative; in 100 per cent of twenty-six cases the cell count of the spinal fluid was normal; in 75 per cent of twenty-four cases the globulin reaction was normal, and in 73.1 per cent of twenty-six cases the gold sol curves were normal.

Gourgerot and Durel, of Paris, said that in cutaneous syphilis clinical experiments made thus far have given indisputable evidence of beneficial results with fever therapy, especially when combined with chemotherapy.

Menagh, of Detroit, reported on six months' experience with a mixed group of ninety-nine syphilitics treated with hyperpyrexia combined with chemotherapy. Fifty-four per cent showed improvement, 43 per cent were unimproved and two were not followed. Artificial fever by physical means showed a superiority over malarial therapy only when a satisfactory degree of fever could not be produced with malaria.

Simpson and Kendell, of Dayton, Ohio, in an experimental study of the treatment of thirty-four patients who had early syphilis, by means of artificial fever combined with chemotherapy, said that their observations appeared to indicate that artificial fever fortifies and intensifies the curative action of chemotherapeutic agents and that the time required for treatment can be greatly reduced.

Neymann, of Chicago, in a comparison of 3,000 collected cases in which general paralysis was treated with malarial therapy and nearly 1,000 collected cases in which general paralysis was treated with physical fever, concluded that physical fever has increased the total rate of improvement by 21 per cent and decreased the death rate from between 10 and 30 per cent to a degree which rendered it "no longer a problem." Neymann recommended the use of fever therapy as an adjunct in the treatment of early syphilis.

Kitchevatz, of Belgrade, Jugoslavia, recommended the use of fever therapy produced by means of antistreptobacillary vaccine in the treatment of soft chancre. He felt that it caused improvement and healing of the local manifestations and shortened the duration of the disease.

Ducoste, of Villejuif, France, recommended intracerebral malarial injections in the treatment

of general paralysis. Of 435 paralytics treated by this method in the last ten years, 353 (80 per cent) "have been cured." Failures occurred in 12.8 per cent of cases and there were twenty-six deaths (6 per cent).

Janet and Dreyfus, of Paris, concluded that in gonorrhea the main characteristics of regional hyperthermic treatment were: (1) the striking rapidity of the cure, and (2) the easy management and innocuousness of this therapy. Carpenter and Boak, of Rochester, New York reported on the thermal death time of 250 strains of Neisseria gonorrhœæ at a temperature of 41.5° C. The heat resistance of the gonococcus varied between six and thirty-four hours; the mean was sixteen and one-tenth hours with a standard deviation of four and eight-tenths hours.

Warren, of Rochester, New York, presented an analysis of 163 cases in which gonorrheal infections were treated with fever for periods of time less than the thermal death time of the infecting strain of gonococcus. The length of treatment at 41.5° C. might be as long as 85 per cent of the thermal death time and still fail to result in a cure, while, on the other hand, treatments as short as 10 per cent of the thermal death time occasionally result in cure. Warren concluded that the variation is probably influenced by the defensive mechanism of the body.

Bierman and Horowitz, of New York, have devised a combined local and general heating technic for the treatment of gonorrhea in women. They reported that, during the past six years, of 121 women who were treated by this method the results proved successful in 113 (93 per cent).

Krusen, Stuhler and Randall, of Rochester, Minnesota, reported that of 361 patients who had gonorrhea and were given six to twelve hours fever at 106.7° F., 68 per cent obtained negative cultures and 74 per cent showed improvement. Of 266 patients who had positive cultures and completed treatment satisfactorily, 246 (92.5 per cent) obtained negative cultures. Of forty-one patients subjected to a single ten-hour session of fever, thirty-six (87.8 per cent) obtained negative cultures and three more patients obtained negative cultures after an additional treatment.

Belt and Folkenberg, of Los Angeles, reported on the treatment of sixty-four patients who had gonorrhea, with a single ten-hour fever at 106.8° F. Fifty-nine, or 92.2 per cent, were found to have been constantly free from organisms following the ten-hour session of fever.

Parsons, Bowman and Plummer, of Denver, reported on eighty-seven soldiers who had acute gonorrhea and were treated with fevers of 106.6° to 107° F. for five-hour periods every third day. The patients were divided into treated and control groups. The percentage of cure was the same (72.7 per cent) in both groups but the patients who were treated with fever showed no residual symptoms and the results were accomplished in a third of the time required in the control group.

Trautmen, Stroupe and Devlin, of New Orleans, reported on the treatment of 278 men suffering from gonorrhea. Eighty-seven per cent of the men who had acute gonorrheal infections and 70.5 per cent of those who had chronic infections "were apparently free of gonococcic infection after completion of fever therapy."

Schnabel and Fetter, of Philadelphia, reported on the treatment of 136 patients with gonococcal infections. Seventy of the patients had acute gonorrheal arthritis and twenty had chronic gonorrheal arthritis. Forty-eight of those who had acute gonorrheal arthritis were cured and the remaining twenty-two were improved. Six of those who had chronic gonorrheal arthritis were cured and the other seventeen were unimproved.

Freund and Anderson, of Detroit, reported recovery in a case of gonorrheal endocarditis, following administration of artificial fever at 106.4° F. for thirty hours divided into five periods.

Hazel and Snow, of New York, reported on the successful treatment in one case of gonorrheal septicemia in which two treatments of five hours each at a temperature of 106° to 107.8° F. were used.

TRENDS IN MODERN PEDIATRICS*

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ALL successful business concerns find it necessary, at times, to take stock of supply, demand and obsolescence. It is quite as logical for doctors occasionally to evaluate medical practices. With such an appraisal, one is impressed with some very striking changes in the medical care of infants and children. Some diseases have almost disappeared, certain procedures are now obsolete, while our services are needed in new fields.

With such a survey one notes:

1. The practical disappearance of his chief "stock in trade" of thirty years ago, namely, smallpox, typhoid, diphtheria, fatal diarrheas, florid rickets and scurvy.

2. Infant feeding has been reduced to such simple routine that little medical supervision is now necessary.

3. The knowledge of hygiene of heating, ventilation, clothing and contagion has cut down the incidence of upper respiratory infections. A general practice of putting a child with an incipient cold to bed in an equable temperature, forcing fluids and providing a light diet, has cut off many grave complications, formerly necessitating medical attendance.

Now, all of these changes have been to the advantage of the infant and child but result in a sharp economic loss in pediatric practice.

However, to replace these losses, there are newly developing fields of endeavor wherein the child can be greatly benefited and the pediatrician may demonstrate he is still a useful citizen in his community. We are cognizant of much important research in cellular chemistry, studies on glands of internal secretion, chemotherapy, search for new curative and preventive sera and inoculations, as yet not practicable, but we are in possession of other facts, which permit of generalization and daily application. Of numerous advances, there are four which I wish to discuss briefly: (1) preventive medicine; (2) better knowledge of nutrition and growth; (3) promotion of health habits; and (4) prevention and early correction of behavior problems.

Preventive Medicine

Now, all four of these problems are preventive measures, but I refer especially to the avoidance of certain specific infections. You know successful vaccination will prevent smallpox. Through immunization against it, diphtheria is on the way out. Employment of the Dick technic against scarlet fever or some modification of it, may win general acceptance. Experience with Sauer's vaccine in preventing whooping cough is encouraging and certainly worth a trial. Military experience, throughout the world, testifies to the efficiency of typhoid vaccine against typhoid fever. But wistful wishing will not prevent these diseases. Procedures of active immunization must be carried out. They present no technical difficulties. A reasonable routine would be to begin protection against smallpox, diphtheria and pertussis at about six months of age, or even earlier; against scarlet fever before entering school, and against typhoid in the face of any threatened outbreak and for our transient, widely traveled, trailer population. One might ask how willing are parents to accept this regime? From my own experience I would say they are most cooperative. It is routine with us, well up to 100 per cent, and, moreover, parents are willing to pay reasonable fees for this work.

Growth and Nutrition

Workable standards of growth and development are in our possession; our knowledge of nutrition is increasing; most of the fundamentals are known. Mineral metabolism is on a scientific basis; the necessary amino-acids and their protein sources are known; knowledge of the metabolism of starches and fats, though not final, is serviceable; the chemical structures of four important vitamins are known, three of which can be synthesized. All this knowledge now replaces much which was theory and conjecture twenty-five years ago. But you say it is all so technical. This is not so. Height and weight

*Read before the annual meeting of the Minnesota State Medical Association, Saint Paul, Minnesota, May 3, 1937.

determinations compared with standard tables at once inform us of the deviation from the norm. Of course, we can not standardize the human family, and reasonable allowance must be made for familial tendencies and types of body build. An inspection of bone development and the state of dentition gives us information as to skeletal nutrition. A simple blood examination will determine if anemia is present. With a knowledge of the normal, which we should have if we attempt anything in medicine, we now try to correct deviations from the normal in our patients. By referring to memory or simple tables, we can approximate the nutritional demands of our patients and proceed to outline a diet. It is not well known that the science of diet has been reduced to a simple, practical basis. Any recent text on diet will present understandable tables from which a sensible diet can easily be compiled. Too much detail may lead to confusion. In a gross way, one may state the minimal daily diet for a healthy growing child should include:

One and one-half pints of milk.
A generous supply of vegetables.
A generous supply of fruits and fruit juices, especially orange or tomato.
An egg or two.
A moderate amount of meat.
A moderate amount of cereal and breadstuffs.
Water to maintain balance.
Cod liver oil or its equivalent.

A simple anemia will respond to an iron salt. Only a prolonged deficiency diet will require other specific vitamin therapy. Experience and familiarity breed speed and efficiency so that nutritional management can become a pleasant task rather than a bugbear.

Promotion of Good Health Habits

It will be accepted as axiomatic that the health, accomplishments and happiness of an individual depend greatly on habits established in infancy and childhood. In spite of this, they are sadly neglected. By health habits, we mean regular schedules for eating, for bodily evacuations, regular times for play, rest and sleep, bodily cleanliness, care of the teeth, training in obedience and coöperation, social adjustments and numerous other details of living. It is of little value to outline a proper diet if the child will not take it. Undue fatigue may set up a whole train of bad habits, leading to serious problems. An unenlightened mother, in spite of best intentions, may wreck her child's health. Yet, too often, health habits are ignored by the physicians, and the layman often feels that these problems are aside from medicine. From intensive child study, it has been determined how much play, rest and sleep the average child, at a given age, requires. Contributions have also been made in methods of overcoming many problems in child training. All this, again, has been reduced to a practical basis. This, most assuredly, falls within the province of the physician, who should be in position to add just the right amount of common sense necessary to all rules as applied to children.

Behavior Problems

Behavior problems grow out of heredity, faulty health habits and environment. A goodly share of my energy goes into helping parents with behavior problems. I admit many shortcomings on my part, but not a lack of interest. Life is strenuous even for the young. They encounter strains and cross currents quite as much, or more, than the adult. The population of institutions for mentally unbalanced and insane far outruns the capacity to care for them, and the rate is increasing. Students of this situation contend that efforts to correct behavior problems and reduce maladjustments early in life may forestall many of these calamities. Is it strange that Johnny, who is underweight, has severe dental caries, has poor muscle tone, is chronically fatigued, unable to keep pace with his pals, should fall into a whiny, introspective state and become a problem in his home, school and community? Is it strange that Mary, as she approaches puberty and acquires a stepfather, lacking in understanding, should assume the attitude of a rejected child and become delinquent? Who should be in a better position to get a right perspective than the physician who probably brought them into the world and has followed them through their physical tribulations since? Many lesser behavior problems arise which may grow into big ones and eventuate in grave maladjustments. Some of these are thumb sucking, nail biting, head banging, night terrors, temper tantrums, neurotic vomiting and enuresis. These may not be explained away as being caused by teething or worms. A better approach, and one

too often overlooked, is that the patient possesses a psyche which is responding peculiarly to environmental influences. A rational technic is now at our disposal in helping to correct most of these problems.

Now, most of these advances or lead lights have originated in medicine, some from clinical studies and some from tedious research. It is an interesting observation, that when facts have been established and brought to practical application, some bureaucratic agency or uplift organization appropriates the knowledge and at once sets itself up as a fountain head of all truth. But the doctor can do the job much better. We should not let others usurp our rightful place.

When I began my practice only certain activities of a doctor commanded a fee, such as setting a broken bone, administration of an anesthetic, the writing of a prescription and especially cutting or sewing. Time spent on examination or in giving advice was gratuitous. But here, too, I am sure there has been a change in the layman's viewpoint. Time spent in investigating a patient to arrive at a diagnosis and in giving advice, even without medicine or surgery, is now considered worthy of its hire.

I wish, however, to make a still more practical application of this discussion. We hear much of the oncoming state or social medicine. Mark Twain said, "Everybody talks about the weather but no one does anything about it." So it is with state medicine. True, we discuss it in our medical meetings, appoint committees, etc., but we do little intrinsically to avert or lighten the blow. Remember the appeal of the crippled child is universal and provocative. Medical neglect of children provides the most powerful argument for some form of social medicine. Let us look close to home. Some day a survey of your village or county will be made, with the startling disclosure that, for instance, only 5 per cent of the children of school age have been vaccinated against smallpox and perhaps only 3 to 5 per cent against diphtheria. Suddenly some public health organization will come in and clean up this situation. Or again, a survey will show a large percentage of children under weight, anemic, with dental caries and below normal standards. Someone will move in a diet kitchen and tell your countryside how to feed kids. Or again, an uplift association will get excited about some new idea for training in child health habits and, behold, a shepherdess to lead them. Or again, child delinquency will force the setting up of a psychiatric clinic.

It is my contention that the medical profession has the knowledge and equipment to care for these problems, but we must show interest and do something about them. Of course, we need state medicine in an economic sense. There should be monetary help so that indigent parents may avail themselves of these aids and protections for their children, and to provide the laborer a living wage. But we do not need a bureaucratic treatment machine to run over the family physician, or reduce him to a clerkship. The choice may lie with us.

SINUSITIS*

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THERE is probably no diagnosis which arouses more suspicion in the mind of the average lay person than that of sinus disease. Time after time the patient confronted with such a diagnosis slides out of the examining chair with the remark that he doesn't wish anything done about it because one of his friends who started treatments for sinus trouble never did get through.

This distrust on the part of the public can mean only one thing. Something has been wrong, and perhaps still is wrong, with our concept of sinus disease. It is upon this premise that this paper has been prepared. The subject can be discussed only in general terms. The time is too short and the audience too general for detailed classifications and exhaustive discussions of the individual sinuses.

Sinusitis, in the not too dim and distant past, has been held responsible for most of the ills

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that flesh is heir to. It was eagerly pounced upon as another focus of infection when doctors found out, somewhat to their chagrin, that extracting the patient's teeth and tonsils quite often failed to cure his rheumatism, peptic ulcer, asthma, or kidney trouble. We must admit that hundreds and probably thousands of sinuses have been operated upon ill advisedly. May I quote one example: In 225 cases of retrobulbar neuritis seen at the Mayo Clinic, Benedict[1] reported only one as due to sinus disease. Yet among 500 cases of multiple sclerosis, 60 per cent or 300 patients had had intranasal sinus operations because of visual disturbances—one of the common early symptoms of multiple sclerosis. A similar picture, nearly as bleak, could be painted for sinus surgery directed toward the cure of asthma. It is for reasons such as these that the subject of sinus disease is accompanied by a large question mark in the minds of our patients.

Physiology

The anatomy and physiology of the sinuses may be summed up very briefly. Each sinus has an opening into the nasal cavity, and is ventilated with each respiration, the pressure dropping below normal with inspiration and going above normal with expiration. The interior of the nose and sinuses is lined with ciliated epithelium, and the normal mucous secretions are swept in a steadily moving film by the cilia toward the pharynx and down into the stomach. Thus infective particles that gain entrance to the nose or sinuses are promptly swept out again. Most sinuses are normally sterile.

What then, we may ask, causes sinus disease? The causes may be divided into two groups: local and general. Under local we must consider anything which interferes with the normal ventilation and drainage of the sinuses, such as congenitally narrow nasal passages, adenoids, deviations and spurs of the nasal septum, and enlarged, malformed turbinates. Under general causes we must consider factors which lower our resistance, such as exposure to cold, fatigue, improper food, overheated rooms, and lack of proper humidity. In addition, as regards the maxillary sinus, we must remember that the roots of the upper teeth lie in close proximity, and the records of the Lahey Clinic, as reported by Hoover,[2] show that 10 per cent of antral infections are dental in origin.

Bacteriology

Our knowledge of the bacteriology of sinus disease is, like that of the common cold, not as yet satisfactory. In 166 cases of maxillary sinus disease, acute and chronic, Enlows and Alexander[3] found pure cultures of streptococcus viridans in 43 per cent. The pneumococcus was found alone in 14 per cent. Streptococcus hemolyticus in pure culture was present in 9 per cent, and the remaining third of the cases were made up of various mixtures of streptococci, staphylococci and pneumococci. Interestingly, there were no evidences of micrococcus catarrhalis, and no anerobic organisms. Following the work of Dochez, a filterable virus seems to be pretty definitely established as the primary etiologic agent, but the presence of the virus does not detract from the importance of the accompanying organisms mentioned above which apparently become activated by the virus. It is significant that swine influenza is transferable only by a virus *plus* bacteria.

Symptomatology

Most of the symptoms of sinus disease, such as nasal discharge, local pain, temperature, sensitivity of the upper teeth, et cetera, are too well known to merit discussion. It is my impression that the patient with a chronic cough or bronchitis is occasionally overlooked as a sinus suspect. The symptom complex in children should be reviewed. It consists of chronic cough, anemia, loss of weight, frequent colds, a pasty complexion, nasal discharge, headache, cervical adenitis, and frequent otitis media.

Wherein lies our biggest error in the diagnosis of sinus disease? The question of allergy is approached with considerable trepidation because of its recent popularity in all fields of medicine, and yet there can be no doubt but that allergic states have been the most common cause of incorrect diagnoses of sinus disease. The pallor of the nasal mucous membranes is the first clinical finding that should put us on guard. The family history is all important. The presence of numerous eosinophiles in the smear of the nasal secretion is almost pathognomonic. Do not let the sinus x-ray deceive you. The sinuses

may appear cloudy simply because of allergic thickening of the lining mucous membrane, and the roentgenologist must if possible learn to differentiate between this allergic thickening and actual disease.

Brief mention should be made of the complications of sinus disease. Our greatest danger lies in direct extension to the brain in the form of meningitis, brain abscess, or cavernous sinus thrombosis. Sander[4] reviewed the recent reports in the literature and found that 8 per cent of brain abscesses were due to infected frontal sinuses. Orbital abscesses may develop from ethmoid infection, and at times require external drainage in addition to drainage through the nose. Otitis media, especially in children, has already been mentioned. Ferraris[5] discusses the literature on the subject of optic neuritis and advises conservatism as regards sinus surgery. Iwaszkiewicz[6] analyzed 732 cases of sinus disease and found that only 3 per cent showed ocular complications. Farrell[7] reports 86 per cent of 66 cases of bronchiectasis showing roentgen evidence of sinus disease. The question of asthma needs careful analysis. Cooke and Grove[8] studied 248 cases of asthma due to bacterial allergens and found the sinuses to be the etiologic factor in 92 per cent. One hundred and twenty of these patients had radical sinus surgery, and 70 per cent of these were definitely improved. Sinus surgery is *not* indicated in asthmatics whose allergen is *not* bacterial.

Treatment

The treatment of sinus disease can be discussed but briefly. We should consider carefully the question of prophylaxis. In children it is generally accepted that the removal of diseased tonsils and obstructing adenoids is the most effective therapeutic measure. In adults, submucous resection to open up noses blocked by deviations and spurs of the septum is definitely indicated. The study of questionnaires sent to our patients following submucous resection reveals a rather marked diminution in the number of winter colds and sinus complications. General hygiene, including proper diet, rest, ventilation, and humidity can be only mentioned. Large doses of vitamines A and D have *not* decreased the incidence of respiratory infections in children. Vaccines have been used for many years, but it is the concensus of opinion that most mixed vaccines confer a minimum of protection.

Acute sinusitis should be treated, as a rule, conservatively. Our purpose should be to aid the normal physiologic activity of the nasal membranes. Proetz says, "To my mind the cilia are by far the most potent factor in restoring and maintaining nasal health."

The medicinal agents used in the treatment of sinusitis are too varied to admit of any specificity. Parkinson[9] states, "By no interpretation of physiologic facts can one correlate such different substances as oils, colloids, antiseptics, lysates, electrolytes, adrenalin, cocaine, ephedrin, and their innumerable combinations." A review of the physiologic action of various commonly used nasal medications is extremely illuminating:

Liquid petrolatum, the vehicle of most of the nose drops on the market, causes marked slowing of the ciliary stream.

Argyrol and neosilvol cause a similar slowing.

Adrenalin 1-1000 causes immediate ciliary paralysis.

Cocaine in more than 2.5 per cent concentration causes slowing or paralysis of the cilia.

Merthiolate even in 1-10,000 dilution causes slowing.

Eucalyptol, menthol, thymol, zinc sulfate, and adrenalin all definitely slow or paralyze the cilia.

Tap and distilled water promptly stop all ciliary activity.

Physiologic saline has no effect on the cilia.

Ephedrin from 0.5 to 3 per cent in saline is harmless and may even cause sustained acceleration.

Thus, the only drug for which we have a physiologic indication in the nose is ephedrin, dissolved preferably in normal saline.

Local heat, in the form of moist packs or the infra red lamp, is definitely efficacious. Steam inhalations are helpful in that they render the muco-pus more liquid, making it easier for the cilia to clear the nasal passages.

Operative procedures in acute sinusitis are necessary only when pain and fever indicate

obstruction of drainage and should be limited to the evacuation of the pus. Lillie[10] calls attention to the bad effects of frequent, prolonged irrigations of the nose and sinuses because of their tendency to waterlog the mucous membranes.

Chronic sinusitis can often be prevented by recognition and proper treatment of the acute case. In considering surgery we must be governed largely by the condition of the sinuses themselves. The persistence of chronic infection, thickened, hyperplastic mucosa, and polyps call for surgical interference, and the choice between intranasal and radical procedures must depend on the degree and extent of the involvement.

Conclusions

In conclusion, may I emphasize two points:

1. Allergy must always be considered as a primary factor in nasal disturbances, and must be carefully ruled out before a diagnosis of sinusitis is made.

2. We must be much more conservative in advising sinus surgery, particularly to patients with asthma or ocular symptoms, if we are to win back the confidence of the general public regarding the treatment of sinus disease.

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CONVALESCENT SERUM TREATMENT IN THE PREPARALYTIC STAGE OF POLIOMYELITIS

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THIS study of 2,761 clinical and 1,855 control cases was made with the idea of determining statistically the specificity of human convalescent serum in the treatment in the preparalytic stage of anterior poliomyelitis. Such an evaluation is difficult for various reasons. The material comes from different localities and over a period of years and epidemics, of course, vary greatly as to locale and time. The methods of handling material are not standardized. What one observer calls paralysis, another calls a paresis or muscle weakness. In some cases we have definite follow-up observation, and in others none. One of the greatest difficulties comes from the lack of large numbers of scientifically adequate controls. For this study, however, we felt that certain prerequisites were necessary. First, only those cases were included in which the diagnosis, we felt, was unimpeachable. That is, diagnosis depended on spinal fluid counts plus the symptomatology and the course of the disease. Second, only those cases which were treated in the preparalytic stage are included in this study.

The main considerations in determining the specificity of convalescent serum are three in number: (1) mortality; (2) the amount of paralysis or muscle weakness during the acute stage; and (3) the residual paralysis.

For the sake of exactness, we have divided the cases into three groups: (1) those with no control; (2) those with controls which we felt for one reason or another were not to be relied on as scientifically accurate, and (3) those with controls scientifically sound.

Table I shows the evidence derived from the uncontrolled material. It is interesting to note the extreme differences in results in both the mortality and paralysis or muscle weakness. In this group of 215 cases all treated with human convalescent serum we have an average mortality of 9.4 per cent, paralysis of 8.1 per cent and no residual paralysis in 51.1 per cent.

TABLE I. UNCONTROLLED GROUP

Author	Time	Place	Number Exper. Cases	Number Cases Control	Deaths		Paralysis or Muscle Weakness		Residual No Paralysis	
					Control	Exper.	Control	Exper.	Control	Exper.
Peabody	1916	Mass.	51	0		10.0%				69.0%
Amoss	1916	Mass.	14	0		14.3%		14.3%		
Silverman	1928	Syracuse	7	0		.0%		14.0%		
Silverman	1929	Syracuse	5	0		40.0%		.0%		
Shaw	1924	San Francisco	5	0		.0%		.0%		
Shaw	1930	California	53	0		1.9%		16.9%		84.4%
Cowie	1931	Michigan	80	0		.0%		3.8%		.0%
			215			9.4% AV.		8.1% AV.		51.1% AV.

TABLE II. INADEQUATELY CONTROLLED GROUP

Author	Time	Place	Number Exper. Cases	Number Cases Control	Deaths		Paralysis Muscle Weakness		Residual No Paralysis	
					Control	Exper.	Control	Exper.	Control	Exper.
Zingher	1916	N. Y. C.	54	22	4.5%	.0%	33.0%	19.0%	55.0% At 8 we	80.0% eks
Ayer	1921-26	Syracuse	95	31	3.3%	8.0%	25.0%	18.0%	90.0%	86.0%
Silverman	1924	Syracuse	32	14	.0%	3.0%	35.8%	12.0%		
Silverman	1926	Syracuse	27	1	.0%	15.0%	.0%	51.9%		
McEachern	1928	Manitoba	74	54	11.0%	.0%	63.0%	13.0%		
McNamara	1925-31	Australia	133	151	9.0%	.0%		?		
Aycock	1927	Mass.	106	482	14.0%	.9%		64.0%	1.2% 2 mo. l	36.0% ater
Aycock	1928	Mass.	116	297	18.5%	6.0%	?	61.2%	53.3% About	43.0% 3 mo.
			637	1051	12.0% AV.	3.0% AV.	31.3% AV.	34.1% AV.	49.8% AV.	61.0% AV.

Table II is that of the inadequately controlled group. The controls in most instances in this group were seen after the acute stage, in some cases months after, and the mortality was taken from records. This is not true in the groups of Zingher and Ayer. Zingher's controls include twelve taken from hospital records and ten cases in which horse serum was given. Ayers thirty-one controls were all given pneumococcic serum. In this table, it will be noticed that no figures are available in the last two columns in the groups of Silverman, McEachern and MacNamara, as there was no follow-up recorded in these cases. The finest work in this group was undoubtedly done by Aycock at the Harvard Medical School. The muscle examinations in these patients were done with the idea of arriving at figures to show percentage of paralysis per patient. His controls, however, were all patients seen after the acute stages by the Harvard Committee on Infantile Paralysis. One must, however, be especially careful in comparing the results in a group of treated cases with a group of untreated ones taken at large, for the reason that the number of mild abortive cases missed is indeterminate.

To sum up the evidence, from this group of 637 experimental and 1,051 inadequate control cases we find that the only significant evidence

TABLE III. ADEQUATELY CONTROLLED GROUP

Author	Time	Place	Number Exper. Cases	Number Cases Control	Deaths		Paralysis or Muscle Weakness		Residual No Paralysis	
					Control	Exper.	Control	Exper.	Control	Exper.
Laidlaw	1931	N. Y.	689	45	4.4%	3.5%	24.4%	19.1%	71.1% (3 wks.:	77.4% 3-4 mo.)
Park	1931	N.Y.C.	519	408	.9%	3.8%	28.0% (3-4 w	27.2% eeks)	84.7%	76.6%
Previtali	1931	N.Y.C.	68	181	A- 2.2% Human B-13.0% Horse C- .9% None		20.3% 19.0% 25.0%		77.2% 67.0% 73.0%	
Previtali	1931	N.Y.C.	7	20	.0%	.0%	5.0%	3.0%		
Aycock	1931	Mass.	42?	40	.0%	5.0%	56.4%	46.5%	43.6%	53.5%
Fisher	1931	N.Y.C.	477	102	2.0%	3.8%	27.4%	27.2%	84.7% (6	78.6% Mo.)
Dennig	1932	Stettin, Germany	7	8	.0%	.0%	13.0%	15.0%	87.0%	84.0%
			1709	804	3.03% AV.	2.6% AV.	42.7% AV.	22.6% AV.	73.0% AV.	74.9% AV.

for the specificity of convalescent serum is to be found in the average mortality. Here we find that there is a 3 per cent mortality in the experimental group as against a 12 per cent mortality in the controls. This, statistically, is a really significant difference. The 34.1 per cent paralysis in the treated and 31.3 per cent in the controls is a difference which is insignificant. As also is the 11 per cent difference in favor of the treated group in the residual.

The next table is the most important, for it is the one in which all controls are adequate and scientific.

It is Park's organization which has made the first three groups possible. Before the epidemic of 1931 the Health Department of New York City was well organized so as to record a large number of bona-fide, unselected controls, seen by physicians of the Academy of Medicine under Park's supervision. Park, realizing that most patients treated at home requested serum, stopped using it on the patients treated at the hospitals. In this group of a rather large number of treated and control cases, there is, as can be seen, no significant statistical difference between the two, except in the mortality, where four times as many patients died among those treated as in the unselected scientific controls.

Laidlaw's material, which came from upper New York State, was gathered in much the same way as Park's, consultants seeing all cases reported from the beginning.

Previtali's first group comes also from Park's organization. The 181 controls marked B and C were given, in some cases, horse serum, and in others, no serum. A is the group treated with human convalescent serum. The differences in each column, between these three groups, are definitely, statistically insignificant with the possible exception of the mortality, which is lower in those untreated than in those in which convalescent serum was used. The next group of Previtali is from his own private practice.

Aycock's group, although smaller than some of the other groups, has been very thoroughly studied. His controls are also unimpeachable, each patient having been studied from the standpoint of per cent paralysis per patient. Again, we find in this most intensive study a significant difference only in the mortality, and that definitely in favor of the controls. At this point it is of interest to note that Aycock's conclusion after the epidemic of 1927 in which inadequate controls were used was most optimistic, whereas he concluded from the work of 1931, using adequate controls, that he "failed to obtain statistical evidence that convalescent serum is effective."

No large well controlled group treated only in the preparalytic stage has been reported since 1932.

The averages in Group 3 or that of adequate controls have not been commented upon before. The lack of significant difference in this, the most important group, is obvious, in all columns

TABLE IV

	Mortality		Paresis		Residual No Paralysis	
	Control	Exper.	Control	Exper.	Control	Exper.
Group 1. No Controls		9.4%		8.1%		51.1%
Group 2. Inadequate Controls	12.0%	3.0%	31.3%	34.1%	49.8%	61.0%
Group 3. Adequate Controls	3.03%	2.6%	42.7%	22.6%	73.0%	74.9%

except that having to do with paralysis, where the treated cases showed an average 22.6 per cent and the control cases 42.7 per cent. However, this difference is not one of statistical significance (Table III).

Table IV shows the averages already given. The group of inadequate controls shows, as we have said, no significant statistical difference except in the mortality, and that is in favor of the treated group.

Conclusion

From this statistical study, especially of the group in which we had 1,709 treated cases and 804 adequate controls, there is no evidence that human convalescent serum is of value, when used in the preparalytic stage of anterior poliomyelitis.

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No Sunshine in Soap

During the past year certain brands of soap have been flamboyantly exploited for their vitamin D content; one for the "filtered sunshine" in its lather. The latter product was introduced to the public with double page spreads in national magazines under the caption: "The Dawn of a Great Beauty Discovery." There is evidence that irradiated ergosterol may be absorbed through the skin of rats. This evidence has been an excuse for adding vitamins to various cosmetic preparations. Redgrove points out that the real question at issue is not the ability of the skin to absorb these substances, but "whether when so absorbed the vitamins exercise any beneficial action on the skin—in short, whether they are of any cosmetic value." Even if it is established that vitamin D exercises any beneficial action on the skin, it still must be proved that it has a beautifying effect. As a matter of fact, there has been some recent evidence which indicates that the alleged beneficial effects mentioned by Redgrove as resulting from the use of cod liver oil in the promotion of healing of wounds and burns were probably due to some other factor than the vitamin D content of the oil. It is not surprising that the Federal Trade Commission has recently published a complaint issued against a manufacturer who has made extraordinary claims about his product. The advertiser who proclaimed the Dawn of a Great Beauty Discovery may soon be worrying about the twilight of the day when the sky was the limit for claims about "sunshine soaps." (Jour. A.M.A., August 14, 1937, p. 509.)

CASE REPORT

MALIGNANT HYPERTENSION FOLLOWING BILATERAL LUMBAR SYMPATHECTOMY FOR RAYNAUD'S DISEASE*

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Raynaud's disease and malignant hypertension both are encountered somewhat infrequently in general practice. This case is reported because, as far as we know, it is the first of its kind. Both diseases are characterized by occurrence of vasospasm. Furthermore, surgical treatment of Raynaud's disease of the lower extremities and of essential hypertension is very much alike, consisting in the former case, of performing lumbar sympathetic ganglionectomy and a resection of the sympathetic trunk and, in the latter case, consisting of performance of a more extensive sympathectomy of the Adson-Craig type. In the case reported below, hypertension of the malignant type developed in spite of performance of bilateral lumbar sympathetic ganglionectomy and a resection of the sympathetic trunk for relief of Raynaud's disease.

Report of Case

A white, married woman, aged forty-five years, came to The Mayo Clinic for the first time on April 1, 1932. She complained of color changes of the fingers and of the hands on exposure to cold. Her first symptoms began in May, 1931, when she noticed blanching of the little finger of the left hand; this was promptly followed by symmetrical involvement of all the digits of both hands. The red, white and blue color phases were noted. Pain was not experienced with these early color changes. Similar color changes were noted simultaneously in all the toes in January, 1932.

Excitement and exposure to cold always brought on her symptoms. Later, these symptoms were accompanied by numbness of the digits and by generalized weakness. She promptly recovered from her symptoms in a warm room. This patient also stated that occasionally a tired feeling developed in the calf muscles of both legs when walking on a cold day. On two occasions she had to stop walking. Rest gave prompt relief. She had also experienced similar sensations while dancing. She had observed that she could walk farther on a warm day than she could on a cold day. This patient's father and mother were living and were well. Four sisters were alive and were well. Two brothers were considered to be well until they were six years of age at which time both of them developed an insidious paralysis of the legs and became invalids; one brother died at twelve years of age and the other died at nineteen years of age. There was no history of hypertension in the family. The patient had been married fifteen years and had two healthy children. Her menstrual periods were normal, but flow was scant.

At the time of her physical examination the fingers and toes were cold, mottled and cyanotic. Pulsations in the brachial, radial and ulnar arteries, as well as in the femoral, popliteal, dorsalis pedis and posterior tibial arteries were within the normal range. Definite scleroderma was not present. Neurologic examination gave objectively negative results. In a room of which the temperature was 23.8° C., the surface temperature of her fingers ranged from 25.5° C. to 26.1° C., and the surface temperature of her toes ranged from 26.1° C. to 28.1° C. Following oral administration of 1 ounce (30 c.c.) of ethyl alcohol, there was a uniform rise of the surface temperature of her fingers of 10° C. to 10.6° C. The rise of surface temperature of her toes was somewhat less uniform and ranged from 6.9° C. to 10.2° C. Normally, the surface temperature of the feet rises less than that of the hands during this test.

The blood pressure was 132 mm. of mercury systolic and 84 diastolic: the pulse rate was 96 per minute. Examination of the ocular fundi by Dr. Wagener revealed some excess glial tissue on the disks. The retinal arteries had an exaggerated reflex but sclerosis was not present. The specific gravity of the urine was 1.030; the urine was acid in reaction and albumin and sugar were not present; microscopic examination gave negative findings. The concentration of hemoglobin was 14.2 gm. per cent, erythrocytes numbered 4,450,000 and leukocytes numbered 5,700 per cubic millimeter of blood. The serologic test for syphilis and a roentgenogram of the chest gave negative results. Special examination of the urine for lead and arsenic showed that lead was not present, but 200 c.c. of urine contained 1.03 mg. of arsenic.

On April 8, 1932, Dr. Craig performed a right and left lumbar sympathetic ganglionectomy and a resection of the sympathetic trunk for the Raynaud's disease. The patient had an uneventful recovery and the wound healed by primary intention. The feet were warm, pink and dry at the time of her dismissal. No changes were noted in the hands.

On July 23, 1937, the patient returned to the clinic complaining of blurred vision, of headaches during the past two months and of hypertension for one year. In March, 1934, her blood pressure was 145 mm. of mercury systolic and 90 diastolic.

In July, 1936, her family physician found that she had a severe degree of hypertension. Headaches were severe, but administration of acetylsalicylic acid (aspirin) gave her relief to a slight extent. Her vision had diminished so that it was difficult for her to distinguish people at a distance of 10 feet (3.3 meters).

Approximately four years previously, the skin of the terminal phalanges of the hands and the skin about her mouth, face and neck had become tighter and definite evidence of scleroderma had developed. She had continued to have color changes of the Raynaud type, in the hands but not in the feet.

*From the Division of Medicine, The Mayo Clinic, Rochester, Minnesota.

Physical examination revealed a thin, emaciated woman who had a glossy, tightened skin over the face, neck and terminal phalanges of the hands. No scleroderma was present in the feet; she weighed 87 pounds (39.5 kg.). The blood pressure was 234 mm. of mercury systolic and 150 diastolic. When the blood pressure was taken at hourly intervals, there was a systolic range of 190 to 240 mm. of mercury and a diastolic range of 100 to 170. The second aortic sound was accentuated. Examination of the fundi by Dr. Wagener revealed generalized narrowing of the retinal arteries of grade 1 to 1+ (on a basis of 1 to 4), sclerosis of grade 1 to 2 and localized angiospastic narrowing in the smaller and more peripheral arteries. Scattered cotton wool exudates and hemorrhages were present, as well as edema of the disks to an extent of 2 to 3 diopters. Macular stars were not noted. From the appearance of the ocular fundi, Dr. Wagener thought that one should consider the possibility of acute angiospastic retinitis, in contrast with that of frank malignant hypertension. Pulsations could not be detected by palpation of the ulnar arteries or of the left dorsalis pedis artery. Pulsations were present in the other palpable arteries but seemed markedly reduced in force. No definite sclerosis was evident. The surface temperature of the fingers was approximately 27.5° C. and the surface temperature of the toes was approximately 26° C. with the patient in a room of which the temperature was 77° F. (25° C.) and the humidity was 40 per cent. It is interesting to note that the surface temperature of the digits was essentially the same at the time of her second admission to the clinic as it was during her first visit.

Urinalysis revealed albumin grade 2 to 3 on a basis of 1 to 4; the specific gravity was 1.015 to 1.019; microscopic examination gave negative results. The concentration of blood urea and of blood sulphates was 30 mg. and 3.5 mg. per 100 c.c. of blood, respectively. The concentration of hemoglobin was 15.2 gm. per cent; erythrocytes numbered 4,040,000 and leukocytes 5,800 per cubic millimeter of blood. The basal metabolic rate was +32 per cent. A roentgenogram of the thorax gave evidence of cardiac enlargement and of dilatation of the arch of the aorta. The electrocardiographic tracing revealed a cardiac rate of 119 per minute, sinus tachycardia, iso-electric T waves in derivation 3 and QRS complexes that were notched in derivations 2 and 3 and slurred in derivation 1. The serology of the blood was normal. Following intravenous administration of pentothal sodium (565 mg.) the blood pressure decreased from 200 systolic and 135 diastolic to 180 systolic and 124 diastolic. With administration of 9 grains (0.6 gm.) of sodium amytal, the blood pressures dropped from 220 and 160 to 168 and 112. Following administration of 3 grains (0.2 gm.) of sodium nitrite, the blood pressure decreased from 198 and 140 to 180 and 126. It is very obvious from these tests that the patient had a fixed type of hypertension and she was not suitable for performance of extensive sympathectomy such as has been carried out at the clinic by Drs. Adson and Craig. She died about three weeks after leaving the clinic.

Comment

It seems logical to assume that the vasospastic disturbance which was originally present in the hands and feet and which did not give rise to hypertension had finally become generalized and was of such degree that it produced a severe hypertension which explained the final clinical picture. In our experience, in the average case of Raynaud's disease, a normal or a subnormal blood pressure is present.

Development of scleroderma in the hands, face and neck was fairly marked at the time of her second visit but there was no evidence of the presence of scleroderma in the feet. Apparently the operation of sympathectomy for the condition in the lower extremities had prevented development of scleroderma in the feet.

At the time of the patient's first admission to the clinic, she presented all the classical signs and symptoms of Raynaud's disease and yet complained of definite intermittent claudication in the lower extremities. This is the first time we have observed this symptom in a case of Raynaud's disease. In fact, we were previously inclined to think that this symptom did not occur in Raynaud's disease.

The finding of arsenic in the urine was apparently accounted for by the fact that previously she had been taking Fowler's solution.

Even though the basal metabolic rate was +32 per cent there was no other evidence of hyperthyroidism. It is not uncommon, in our experience, to observe metabolic rates of this height in cases of severe malignant hypertension.

It is extremely interesting to note that pulsations in the ulnar arteries as well as in the left dorsalis pedis artery could not be detected at the time of her second admission to the clinic, although these arteries pulsated normally at the time of her first admission. It is most unusual to observe occlusion of peripheral arteries of this caliber in cases of essential hypertension and we have not observed it in cases of frank Raynaud's disease. We cannot give an adequate explanation of this phenomenon.

Antitularemic Serum-Mulford

Sharp & Dohme, Inc., presented for the consideration of the Council on Pharmacy and Chemistry Antitularemic Serum-Mulford prepared by immunizing horses by injecting cultures of B. tularense isolated from human cases of tularemia. On request of the Council, Dr. Lee Foshay of the College of Medicine, University of Cincinnati, kindly submitted comparative data obtained from 334 untreated cases of tularemia and 481 serum treated patients. He gave a separate analysis of 133 patients (included in the treated group) who received Antitularemic Serum on or before the twelfth day of the disease. The Council considered Dr. Foshay's data, and, while finding nothing definitely to criticize, concluded that corroborative data by other investigators are needed before the product can be accepted for inclusion in New and Nonofficial Remedies. The Council therefore voted to postpone consideration of Antitularemic Serum-Mulford (Sharp & Dohme, Inc.) to await development of further data. (Jour. A.M.A., August 14, 1937, p. 504.)

THE BACKGROUND OF MEDICAL HISTORY FOR NORTHEASTERN MINNESOTA AND THE LAKE SUPERIOR REGION

By RICHARD BARDON, M.D.

A SUMMATION of some of the medical and hospital history of northeastern Minnesota and the region of Lake Superior merits a brief introduction outlining three major epochs. While the present review is not primarily intended to cover the early exploration period of the eighteenth century, the reader will be better oriented by a short reference to this early colorful period. Two relatively recent books, "The Voyageurs," by Grace Lee Nute, and "Early Candle Light," by Lovelace, should be read by all those seeking a background for our present-day commonwealth.

This early period was decidedly French, or rather, French-Canadian, Indian, and ultimately English as they became supreme in the New World. The human side of the transfer of a great wilderness from Indian control to white usurpation is largely a story of the colorful "Voyageurs de Bois." They were the trekkers, the "safari" for the great fur trading companies in a day when transportation was a matter of canoes, portages, fur trading stations or forts for traffic with the Indians. The voyageur was in the beginning scarcely a generation removed from the immigrant—the most spirited and virile of the French when their nation was in the "Golden Age of Louis the Grand." They were sprightly, singing, praying, cursing, incorrigible, adaptable, indefatigable, and left a heritage and an imprint on this region which may not readily be effaced. Fur trading was not so much a means of gaining a livelihood as an excuse to live in a manner so peculiarly adapted to their temperament and physique. It is too easy in retrospect to lose a sense of their moral fiber and religious devotion in the livelier tales of their drinking, carousing and direct eugenic alliance with the natives. They learned from the aborigines the "methods of living off the country"; in return, they left indelible geographic landmarks and racial imprints: the names of cities, capes, promontories, lakes—mostly French translations of old Indian names. As with all primitive contacts, industrial and missionary in character, the doctors and priests, with the Indian medicine men, became something of a blur. The ability to offer healing solace to the sick or injured was the best approach to the matter of weaning a wavering soul away from pagan worship. The doctors who accompanied the fur traders were, for the most part, itinerants, if not adventurers.

The second phase or epoch began when wars among the European peoples ceased for a full century to embroil their compatriots in the New World. The industrial development of this north region came after the enormous agricultural growth in the mid-American continent, when its fertile land, as James J. Hill said, "had the Indian taken out of it." The varied national groups soon demanded lumber in large amounts. The settlers were readily adapted to the land; they had an extraordinary urge for independent thinking and extreme self reliance. They brought their wives and children, and came to remain; to build cities and farms;

to develop direct land transportation, such as railroads, in contrast to laborious seasonal canoeing via circuitous water routes and portages. The demand for lumber inspired an onslaught of unheard-of proportions, and within four decades the great timber belts of Michigan, Wisconsin and Minnesota yielded, to the axemen and the mills, their centuries of growth. The lumbermen came largely from Maine and Canada, and occupied the timber states—Michigan, Wisconsin and Minnesota—in sequence. In comparatively recent years, after denuding much of Minnesota, they made broader jumps to the far south on the one hand and the Pacific Coast on the other. Scarcely, however, was the timber cut off when iron ore was discovered in large amounts, and offered another inspiring field for industrial exploitation. It had its ægis in the corresponding demand of an era of city and industrial expansion, and was comparable to the agricultural stimulus that speeded up the lumber mills. In any case, industrialism gave the permanent establishment of most of our hospitals that came later. No longer were the doctors itinerants, and a considerable portion of our narrative will deal with the vigorous pioneers who, coming with the above industries, took on, more or less, both the attributes of the times and the atmosphere of their associated industries.

It was not until 1871 that a railroad came from the South (the Northern Pacific, or, as it was known then, the St. Paul and Duluth Line). Up to that time the contacts, medical and otherwise, were far more with the lower lake ports, via water transportation, and to a lesser degree by rail and stage connections with St. Paul. Up until the '90's the medical practitioners came for the most part from eastern Canada, the New England States, or had followed the lumber industry from Michigan up through Wisconsin. Only after 1900 did more and more graduates from our own medical schools settle in northeastern Minnesota.

The early medical history of St. Louis County naturally is the history of the City of Duluth itself, and consequently we shall attempt to sketch the types of hospitals and methods of support devised in the development of the lumber and mining industries. St. Mary's Hospital in Duluth, for example, sold tickets to the men in the lumber industry covering the cost of their hospital and medical care should they be sick or injured. The price of the tickets varied somewhat, but was in the neighborhood of $12 per year, and served a definite purpose in giving the lumberjacks proper medical care and at the same time developing the early hospitals of our city and county. It was something of an outgrowth of this method that led to the development of most of the iron mining hospitals, except that the assessments were levied monthly, depending on the employment. The plan, under various modifications, still exists.

No historical period abruptly ends when another begins; it is so with our empirical and arbitrary divisions given in this introduction.

The third phase of medical and hospital development took form about 1910. There were no obvious changes in the type of management, for example, of the two large hospitals (St. Mary's and St. Luke's) in Duluth, but with the gradual development of agriculture in northern Minnesota and with urban growth commensurate with wider diversification there came the same change in the type of our hospitals characteristic of all in our state. It may suffice to mention that this change coincided with the period in which rampant epidemics, such as typhoid, ceased to recur, and specialism in medicine developed. The profession adapted itself to the gradual division of its labors, and hospitals were built for the expanding needs. This, very shortly, had its influence upon the hospitals: they became very much more complex units, with a service expanding as rapidly

in unit cost as in efficiency. They have become, in other words, symbolic of our eager, alert and vigorous times.

* * *

The Era of Exploration and Fur Trading

A knowledge of the early medical history of northern Minnesota depends on the records left by the fur traders and the reports of the government expeditions into this part of Minnesota over one hundred years ago. The Northwest Fur Company, in particular, had men in its employ who were physicians, but who were primarily traders, or what were known as "clerks." They kept diaries and made reports to their superiors in Montreal, and it is from these records that we have information as to conditions then existing. The records of the various government expeditions that traveled through our part of Minnesota are of twofold interest in that they usually contain reports of the surgeon of the party pertaining to medical matters, as well as other interesting episodes of early travel in the Northwest. It is from these sources that the following information was obtained:

About the year 1750[7] a war party of more than a hundred young men of the Fond du Lac band of Indians visited Montreal to assist the French in their war with the British. They became infected with smallpox, and but few of the party survived to reach their home. It does not appear, although they made a precipitous retreat to their own country, that the disease was at this time communicated to any others of the tribe.

About the year 1782 smallpox again appeared among the Chippewas of Lake Superior. The circumstances connected with this introduction are interesting. Sometime in the summer of 1781 a trader who had ascended the Mississippi and established himself near Leech Lake was robbed of his goods by the Indians residing at that lake, and in consequence of his exertions in defending his property he died soon after. It is of non-medical interest to note here that even to this date the band of Indians living in the region of Leech Lake are known as the "pillager" band of Indians. The facts concerning the death of the trader became known to the British at Mackinac and requests were sent to the Leech Lake Indians that they should visit Mackinac and make reparation for the goods they had taken. At the same time, they were threatened with punishment in case of refusal to do so.

In the spring of 1782[9] the Indians decided to comply with this request, and a deputation from the band visited Mackinac with a quantity of furs which they considered an equivalent of the goods which had been taken. The delegation was received with politeness by the English and the difficulties were readily adjusted. When this was effected, a cask of liquor and a British flag, closely rolled, were presented to the Indians as a token of friendship. They were at the same time strictly enjoined neither to break the seal of the cask nor to unroll the flag until they had reached the heart of their own country. These directions they promised to observe, but on reaching Fond du Lac, Superior, after many days' travel, they could not resist temptation, and unsealed the cask and unrolled the flag for the gratification of the tribesmen. The Indians drank the liquor and remained in a state of inebriation for several days. The rioting was soon over and they were fast recovering from its effects when several of the party were seized with violent pains. This was attributed to the liquor they had drunk, but the pain increasing they were induced to drink deeper of the liquor, and in this inebriated state several of the party died before the real cause was suspected. Other like cases occurred, and it was not long before one of the party, who had visited Montreal in

1750 and who had narrowly escaped with his life, recognized the disease as the same which had attacked his party at that time. The malady proved to be smallpox, and nearly the whole population of three hundred Indians then at Fond du Lac was wiped out. Although the epidemic did not extend easterly on Lake Superior, it is believed that not a single band of Chippewas north or west of Fond du Lac escaped its ravages. As late as 1832 the Indians were firmly of the opinion that the smallpox had been transmitted by the articles presented to their brothers by the British at Mackinac, as a punishment for their crime against the trader at Leech Lake.

Grand Portage, said to be the oldest permanent white settlement in Minnesota, is located in Cook County, and has a glamorous past, not easily visualized from what remains. There is no actual record of the date when the white men first visited Grand Portage. It is possible that Radisson and Groseilliers were there in 1660, and Du Luth probably in 1679. In 1731, however, Sieur de la Verendrye recorded his visit to Grand Portage. Subsequently the French, and later the English, used Grand Portage as a depot for supplies destined for the fur trade in western Canada, the district north of Lake Superior, and the upper Mississippi region. Jonathan Carver, the associate of the celebrated Major Rogers, arrived at Grand Portage in 1767. The present popular historical novel, "Northwest Passage," mentions such familiar names as the St. Croix and Brule rivers as routes of travel for Carver on his canoe voyage from the Mississippi to Grand Portage. During the Revolution, in 1778, there was on duty at Grand Portage a small detachment of British soldiers, under the command of a Lieut. Thomas Bennett—the sole participation of the present state of Minnesota in the Revolutionary War. With the formation of the Northwest Fur Company in 1783, Grand Portage began an era of activity and importance that continued until about 1801, when the Company moved its headquarters to Fort William. Much has been written about Grand Portage, and an article by Solon J. Buck in the *Minnesota History Bulletin* tells the story well.

The historical background of Grand Portage is of interest to the medical profession of Minnesota because it was here, as an employe of the Northwest Fur Company, that the first physician in what is now Minnesota resided. Dr. Henry Munro[8] was born in 1770, the son of Honorable John Munro, one of the members of the first legislative council of upper Canada. In 1796 he entered the service of the Northwest Fur Company as surgeon, and for several years was stationed at or near Grand Portage, at a salary of "1,200 Grand Portage currency." Dr. Munro apparently acted as both surgeon and trader, and in 1804 or 1805 was sent to succeed J. B. Perrault "at the Pic" on Lake Superior.[2] During the war of 1812, when the Northwest Fur Company raised among its men a corps of Canadian voyageurs to fight the Americans, Dr. Munro was appointed "Surgeon's Mate." This corps, commanded by William McGillivray, a famous "Northwester," served in at least two engagements, and was disbanded at Lachine, near Montreal, on March 14, 1813. It is said that the jovial, carefree voyageur was not temperamentally suited to army life, and apparently the corps was not as successful as anticipated. Dr. Munro died August 20, 1854, at Lachenaie, lower Canada, and is buried in the old Protestant cemetery at Mascouche.

Perhaps the most colorful figure of the early fur traders in this district was Dr. John McLoughlin,[3,4] who was at Grand Portage and Fort William, apparently as an assistant to Dr. Munro. Dr. McLoughlin was an apprentice and student of Dr. James Fisher of Quebec for "four years and 6 mos." (a letter from Dr.

Fisher dated April 30, 1803, certifies to that effect), and he was licensed to practice "Surgery, Pharmacy or Apothecary" on May 3, 1803, and apparently was employed by the Northwest Company shortly thereafter. There is record of his residence at Lake Vermillion (some say it was Crane Lake) during the winter of 1807-08 as a trader and surgeon.

Letters of Dr. McLoughlin written in 1808 and 1810 are interesting, inasmuch as they give some idea of his salary, which was apparently not satisfactory to him. They also, in view of what happened in his later life, are typical of his spirit and outspoken nature.

In a letter from Fort William in 1808 Dr. McLoughlin writes to his uncle:

"You tell me in your letter that they may increase my wages. I think they may as I have been doing Dr. Munro's duty these five years without having any allowance although I recollect your telling me that if required to practice I would have 100 pounds, i.e., Dr. Munro's salary. Now the first year I came here Dr. Munro's time was out and tho I was oblig'd all along to do his duty . . . yet they engag'd him and gave him the salary that was promis'd to me . . . the 2nd year . . . I was requir'd to practice while he was sent to an Indian post . . ."

Again he writes on July 13, 1808, from Fort William that he was offered 150 pounds but rejected it because it was "less than Dr. Munro, although I had served an apprenticeship to them of five years for 100 pounds, whereas Dr. Munro had a hundred a year the first four years and two hundred every year after . . ."

Several years later, on August 2, 1810, he wrote the following from Fort William: ". . . even when Dr. Munro was in the country I act'd always as surgeon . . . he only act'd now and then when he happened to be here."

After the Northwest Company was absorbed by theHudsons Bay Company in 1821, Dr. McLoughlin became celebrated as a fur trader and pioneer in the Pacific Northwest. He has been called "The Father of Oregon." The story of his life, "The Whiteheaded Eagle—John McLoughlin—Builder of an Empire," is much more interesting when the reader realizes that he got his start as a surgeon and fur trader in the wilds of northern Minnesota.

In 1826 Governor Cass of Michigan territory came to Fond du Lac to complete a treaty with the Indians. In his party were Henry Schoolcraft, Major McKenny, and Dr. Zina Pitcher of the U. S. Army, along with some soldiers and voyageurs.

Major McKenny[5] kept a diary, which was afterwards published, and in it he recorded the first medical case history within the present limits of Duluth. For July 31, 1826, Major McKenny writes: "I visited today, on the island, in company with Dr. Pitcher and our interpreter, an Indian girl who is afflicted with hemiplegia. About four months ago she was taken with a severe pain in the back of the neck, which, in turn, was soon followed by a complete paralysis of the left half of the body and entire loss of sensibility of the optic nerve, a total amaurosis." This liberal use of medical terminology is explained when the author states that these details were given him by Dr. Pitcher, who made a very careful study of the case. Three days later the doctor applied a cup to the back of the neck: "The blood was very sluggish and dark but the pain was somewhat relieved." The same evening there was further cupping to the right temple and on the following morning cupping to the left temple: "Here the blood flowed more freely and was brighter in color." Food, bedding and better care helped to improve the patient so much that, when the expedition left on August tenth, the doctor was able to report that "there was every prospect of the patient recovering completely, except that her blindness must remain." Dr. Pitcher served in the army from

1819 to 1836, when he located in Detroit, and became well known in state medical affairs.

In 1832 Schoolcraft undertook an expedition to find the source of the Mississippi, and was accompanied by Dr. Douglass Houghton and Lieut. Allen of the army, along with a small detachment of soldiers and voyageurs. Dr. Houghton, in addition to his duties as surgeon, was to vaccinate the Indians along the route and make botanical and geologic observations. At Fond du Lac, which is within the present city limits of Duluth, Dr. Houghton vaccinated two hundred and forty-three Indians. He writes: "In nearly every instance the opportunity which was presented for vaccination was embraced with cheerfulness and apparent gratitude. The efficacy of the vaccine was well appreciated even by the most interior of the Chippewa Indians." No doubt the Indians of that period were well aware of the terrible scourge of smallpox which occurred at Fond du Lac in 1782. Dr. Houghton later became well known in Michigan. He was a practising physician in Detroit; the first state geologist; mayor of Detroit in 1842; a professor in the state university. In 1845, while employed on a government survey, he was drowned in Lake Superior.

The expedition of 1832 made two notable contributions: first, it was successful in discovering the source of the Mississippi; second, the report of Lieut. Allen[1] to the War Department contains an episode which is of interest in that it is probably the first "compensation case" recorded in what is now Minnesota.

The portage above Fond du Lac, which was also called "Grand Portage," was a very difficult one. Today, in driving through Jay Cooke Park, one can visualize the hazards in carrying canoes and provisions over the nine miles of rough country. It was on this portage that a soldier named Beemis, while climbing up the steep river bank fell, with a keg of pork on his shoulder, and injured his back. Beemis was kept in the hospital for more than a year after his return to civilization, and subsequently discharged at Fort Dearborn (Chicago) on a surgeon's certificate of disability.

There were, no doubt, many other medical men of this period who traveled in northern Minnesota, but they left no record of their impressions or mark as physicians. On the first expedition of Governor Cass and Schoolcraft in 1820, a Dr. Alexander Wolcott[6] was surgeon. He was also Indian agent at Chicago, but it does not appear that he made any report of his work as surgeon of this expedition. At a later date, there is record of a young clerk, a physician, who was stationed at Leech Lake in 1833-34, in the employ of a fur trader. In "Letters on the Fur Trade"[6] the following is of interest:

> "My companion for the winter is a clerk; a hot headed Irishman; who has received a liberal education; and was by profession a physician, but he had turned all these advantages to his disadvantage. His art was used to gain the good will of the Indians, for they generally look up to such with a great deal of respect; and not a day passed without extracting teeth and bleeding, and our having a small quantity of medicine which was freely administered to all who applied for it; and the dread and respect they have for medicine men, naturally drew respect from them, and they formed the opinion that our medicines were combined, the white and Indian together. Everything aided to win the respect and esteem of our Indian friends; and my companion, being an excellent musician, we had the means of soothing their savage breasts, although frequently there was only two strings to the violin."

The last of the doctors of the fur trading period in this locality was Charles William Wulff Borup, who for many years was the only trained physician west of the Sault Ste. Marie and north of Fort Snelling. Dr. Borup was born in 1806

in Copenhagen, Denmark, where he received a thorough classical and medical education. He came to the United States in 1828, and was employed by the American Fur Company in 1834, in which he eventually became chief agent on Lake Superior. His headquarters were at La Pointe, although he traveled extensively along the south shore of Lake Superior, and as far west as Leech Lake. Although primarily engaged in fur trading, as were Munro and McLoughlin, Dr. Borup kept up his interest in the practice of medicine, as the records of the American Fur Company will show. He was a subscriber to the *American Medical Journal,* which was sent to him from Philadelphia via the Erie Canal and the Great Lakes to the Sault, there by canoe to his post on the south shore of Lake Superior or on the St. Croix. His order to the New York office of the American Fur Company for February 28, 1835, called for:

"1 good tooth drawer
1 dz. bougies in set
1 lb. camphor
2 ounces Quicksilver
½ lb. cantharides in powder
I ounce sulphur antim. praecepitatum
1 pint spiritus Pennyroyal
½ ounce aleum caryophyl
1 bottle Carpenter's Compounded Syrup of Liverwort
2 Gross vials assorted with corks"
and other similar items

On May 11, 1841, he writes:

"I wish to purchase a newly invented instrument (if it may be called so), the intention of which is preventing the cold air from affecting the lungs. It consists in a kind of mouth covering, furnished inside with metallic springs, through which the air is drawn into the lungs. It is to be had in the principal apothecary shops in Broadway . . . there are two kinds, one for ladies and one for gentlemen."

Dr. Borup settled permanently in St. Paul in 1848, where he died of heart disease on July 6, 1859.

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(To be continued in March, 1938 issue)

EDITORIAL

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Smallpox in Minnesota

MINNESOTA has been experiencing an increase in the usual number of cases of smallpox, which in the past two months has reached the status of a mild epidemic in certain quarters. From the fourth of December until the middle of January, about one-half (149) the total number of cases reported (286) had occurred in Saint Paul with Clay, Pine, Yellow Medicine and Lac qui Parle Counties suffering next in the order mentioned. Strange to state, during this six weeks' period no case was reported from Minneapolis and only one from Duluth. This is quite the opposite of what occurred in 1924 when a laborer from Canada, suffering from malignant smallpox, started an epidemic in Duluth. Minneapolis was severely affected that year and Saint Paul but little. There were 307 deaths from smallpox in the state in 1924, and 198 deaths in 1925. So far, fortunately, there have been no deaths in Saint Paul from the disease.

Each year there are a certain number of cases of smallpox in Minnesota. In 1935 there were 284, in 1936 there were 397, and in 1937 a total of 665. The increase in 1937 was noticeable throughout the last nine months of the year, and particularly in December.

The increase in cases over last year holds true for the country at large. Reports show that this increase has taken place for the most part in the central and north central states and in those states west of Minnesota as far as the Pacific Ocean.

Certain states, notably Massachusetts, have compulsory vaccination laws. Most of our states are content to await the arrival of an epidemic, when regulations requiring vaccination for attendance at school act virtually as a compulsory requirement and stimulates general vaccination. In the interim between epidemics the public becomes lax and the soil becomes fertile for another epidemic.

While smallpox can be almost entirely prevented by vaccination, it is not generally appreciated that a certain number of cases develop in individuals who have been successfully vaccinated. In 1924, for instance, there were in Minnesota 327 cases of smallpox with forty-seven fatalities in individuals who had been successfully vaccinated more than seven years previous to their infection. The importance of revaccination every seven years is therefore demonstrated.

Incidence of Syphilis

AN ACCURATE determination of the prevalence of syphilitic infection is admittedly difficult. However, some of the statements which have appeared recently in magazine articles are gross exaggerations. In articles which appeared in the *Readers' Digest* last year, Parran referred to syphilis as our No. 1 American

killer, and Stokes stated that the disease ranks high if not first among causes of death in this country. In the *Pictorial Review*, Maxine Davis referred to syphilis as the greatest killer of the day, and stated that the leading authorities say that three million sufferers stand in need of treatment each year. Certainly statistics, inaccurate though they may be, do not substantiate such statements.

Studies undertaken by the American Social Hygiene Association and the United States Public Health Service have shown that approximately half a million individuals seek treatment each year and that about 68,300 cases of syphilis are under treatment at any one time. This corresponds to the number of new cases tabulated by the various State Boards of Health, which amount to about half a million. Positive Wassermann reports not designated repeats are considered new cases, but we suspect all such cases are not new because of inaccuracy on the part of reporting physicians. On the other hand many individuals contract the disease unwittingly, resort to drug store medication or seek the services of irregular practitioners and are not recorded. One estimate, that this group of unreported cases amounts to double the number recorded, we consider a rash overstatement. This may have been true years ago, but the number of individuals who seek advice as to the presence of the infection needlessly, incline us to believe that the number of undetected cases does not nearly equal those recorded.

Surveys of various groups have shown a variation from 1 to 25 per cent in positive Wassermann reactions. According to Snow, 5 per cent is probably a conservative estimate for the population as a whole. New infections reach their peak in the age group from twenty to twenty-five and half the infections occur between twenty and thirty years of age. According to the Metropolitan Life Insurance Company, their mortality from syphilis is four and a half times as great in colored as in white males, and six times as great in colored as in white females.

What can be said of the incidence of syphilis in Minnesota? A few years ago 5,000 students at the University were examined and only ten positive Wassermann tests were obtained (0.2 per cent). This, of course, was a selected group and one which had not gone far into the age period when the incidence of infection reaches its peak.

According to the Census Bureau, about six per 100,000 of population died yearly from syphilis in Minnesota during the period of 1932 to 1936. During those same years about 130 died each year from cancer and from 197 to 251 each year from heart disease. To make the comparison more striking, the total deaths in the state of Minnesota in 1936 attributed to syphilis were 162 compared with 3,519 due to cancer, and 6,619 due to heart disease. Allowing considerable leeway for errors in reporting, syphilis is far from heading the list of killers in Minnesota. As a matter of fact, it ranks about eleventh in the nation as a whole.

Minnesota was one of the first states to institute a program to fight venereal disease. In 1918 the activities instituted in connection with the war to control the disease were made permanent. Syphilis was made reportable and free Wassermann testing was provided by the State Board of Health. The foundations were laid twenty years ago for what is today considered essential to venereal control. It is safe to conclude that there has been no falling off in the reporting of new cases to the State Board of Health in recent years as the number of Wassermann tests performed by the State has shown a steady increase until 83,000 were made in 1936. That syphilis in Minnesota has been on the decline is shown by the fact that in 1925, 5,147 new cases were reported and in 1936 only 3,379. This is in keeping with the steady decline in deaths among white policyholders from 1923 to 1930 reported by the Metropolitan Life Insurance Company, a reduction which has been maintained since 1930.

Syphilis, then, is not so serious as a cause of death, as has been stated. It is, however, among the leaders as a cause of human misery. Syphilis in its congenital form, as the cause of heart disease and central nervous system disease and, fully as important, the rôle it plays as a destroyer of the home, places it in the front ranks of the enemies of mankind. If the recent publicity campaign serves to further early diagnosis and treatment, it will have been worth while.

MEDICAL ECONOMICS

Edited by the Committee on Medical Economics of the Minnesota State Medical Association

B. J. Branton, M. D. — W. F. Braasch, M. D., Chairman — J. C. Michael, M. D.
L. H. Rutledge, M. D. — A. N. Collins, M. D.

New Deductions for Doctors

At the request of the State Medical Association, the Minnesota Tax Commission has reviewed the deductions allowed physicians in making out state income tax returns.

The result of this review is a new ruling made by the Commission, Jan. 21, 1938. According to this ruling, physicians may make the same reduction in their state income taxes, for expenses incurred in attendance at medical meetings and in other postgraduate medical education, as are now allowed under the federal income tax.

Concurring in the ruling were H. E. Boyle, chairman; G. E. Wallace and G. F. Gage, members of the Commission, and W. G. Burkman, director.

A Recent Visit to Buenos Aires

Most of us North Americans have a vague idea of what is going on in the other half of our Siamese Twin south of Panama. South America has always seemed so remote that we never have given it much thought. What we know about it has been learned largely from news reels and movies, such as "Flying Down to Rio." A Cuban, Mexican, or South and Central American all looked alike to most of us, and we carelessly put them all in the same group. I am afraid that my idea of their level of culture, including medicine, was none too high before my recent visit to South America.

Comparatively few Americans from the north have visited the southern half of America in the past. In the year 1936, 12,000 tourists left the United States for South America and 250,000 for Europe. The number was increased last year, but even so, there are all too few. The greatest handicaps have been the distance of 5,000 miles to Rio de Janeiro and 6,000 miles to Buenos Aires, and slow, inadequate passenger boats. This has been greatly overcome by the highly efficient Pan-American Airways, and there will soon be better and faster boats. The number of visitors from South America to the United States has doubled in recent years and in the future will undoubtedly be even greater. Great interest in the United States has been aroused in South America by our movies, autos and radios, and they are bent on knowing us better. This is also true in medical circles.

Tide Has Turned

In the past physicians in the Latin-American countries have naturally gone to Europe for graduate training. Since the Great War, and as a result of the current unrest and disturbance in Europe, the tide of graduate medical interest has turned to North America. They are aware of our advances in many fields of medicine and are coming in rapidly increasing numbers to study and learn. It is up to North American medicine to be prepared to offer every opportunity to our South American cousins.

Having received an invitation to attend a meeting of the Pan-American Urological Congress in Buenos Aires, after some hesitation I decided to go and I am glad that I did. Although much time is consumed in the voyage, the journey is most pleasant in every way.

When we finally docked one fine summer morning in December at Buenos Aires, I was due for a series of overwhelming surprises. In the first place, I was fairly swept off my feet by the generous hospitality of our hosts. Argentinians are a wonderful people, virile and progressive, and they will undoubtedly be a large factor in the future development of South America. They are inordinately proud of their great city of

Buenos Aires and the vast resources of Argentina, and rightfully so.

Melting Pot

Let us first glance at Argentina, which has an area of one-third that of the United States, extending some 3,000 miles from Terra del Fuego to a few degrees below the equator, having both an antarctic and subtropical climate, at either end. It has some 13,000,000 inhabitants—almost entirely white—made up of Spanish, with some mixture of Irish, Scotch, British and Indian, who were the early inhabitants. In the last twenty years these were augmented by millions of Italians, Germans and other European immigrants. It is even more of a melting pot than the United States. It is surprising to note how quickly most of the immigrants and all of their children adopt the Argentinian ways, speak Spanish, and become intense patriots of Argentina. Their main resources and wealth lie in the millions of acres of pampas lands, with soil so rich that fertilizing is quite unnecessary. The millions of cattle and the great wheat fields are turned to gold, so that Argentina knows no depression and no unemployment.

Their great capital, Buenos Aires, is a vast city of some 3,000,000 people. With its beautiful buildings, great squares and wide boulevards, wonderful parks and playgrounds, it is one of the most beautiful cities in the world. The Paris of South America, it has been called. It might be almost as appropriate to say that Paris is the Buenos Aires of Europe.

Standards are High

As far as the medical status of Buenos Aires is concerned, I was surprised at the high standards of medical care in that great city. The leaders of the medical profession are well informed, progressive, intelligent and alert to recent developments. Among the many outstanding men of medicine who have received international attention may be mentioned Chutro, Arce, Finochietto and Gutierrez in surgery; Castex, Boneo and Roffo in medicine; Valls in orthopedic surgery, and Saraleguy in roentgenology. Among the various scientists engaged in premedical work is Houssay, head of the University Institute of Physiology. This great scientist has done outstanding work in physiological investigation on the influence of the pituitary on the pancreas and their interrelationship with the hormones of other endocrine glands. Among the honors he has received is an LL.D. from Harvard last year.

The work of Roffo in regard to the cause of cancer has attracted considerable attention. He thinks he has proved that tobacco is a direct cause.

Medicine in Buenos Aires centers around the great medical school. A vast new building with teaching hospitals is in the course of erection, which will cost $10,000,000. It will be the last word in construction to facilitate modern methods of medical instruction. The standards of education are high.

There are three other large medical schools in Argentina, at La Plata, Rosario and Cordova. These, together with the university at Buenos Aires, graduate some 2,000 students annually. Since a large portion of the public is able to pay very little for medical services, the economic opportunities for the recent graduate are none too good.

Vast National Resources

The economic status of the inhabitants of Buenos Aires, as well as of all South America, is somewhat comparable to that observed in France, Italy and other Latin states. Although the natural resources are vast beyond description, they are undeveloped and as a result the opportunities for earning a livelihood are inadequate. Therefore, labor is cheap and there is a large class, in proportion to the population, which is underpaid and living on very little. Fortunately, climatic conditions are favorable and the bare necessities can be obtained for comparatively little. Since the low income group makes up a large proportion of the population, medical practice is necessarily adjusted accordingly. Many of the people are able to pay but little for clinical care and even less for hospitalization, and the government is forced to care for them. As a result, most of the hospitals are charity institutions. Private hospitals, or sanatoria, as they are called, are few in number and inadequate. Although many of the government hospitals are well conducted and the medical services are adequate, the medical and nursing care in most cases would hardly meet the demands of the average citizen of the United States.

Government Medicine

In some of the institutions controlled by the government the service is either inadequate or extravagant. As an illustration of the inefficiency of government control, an institution was erected by the city to take care of roentgenographic diagnosis and radiotherapy for all the hospitals and dispensaries. The institute is controlled by a competent and excellent roentgenographer. However, his assistants, appointed by the government, fail to coöperate with him and as a result there is considerable confusion and the service is often unsatisfactory. On the top floors of the building, which was completed some seven years ago, there are wards with seventy-two beds, fully equipped for radium treatment, but for various reasons means have not been found to employ the two grams of radium which is available. As a result, these wards are taken care of—dusted and cleaned every day, but no patient has ever appeared. On the same floor there is a beautifully equipped room to be used as a library, and the shelves have been bare these seven years because no books have been provided. There could be no more striking illustration of the fallacy of government medicine.

The hospitals are for the most part old and built in the pavilion style. The Rawson Hospital, recently erected, is a fine example of a well equipped hospital, having more than 2,000 beds. Many new hospitals are being planned or are in the course of construction to take the place of those which are old and inadequate. The hospitals are of three types, federal, municipal, and private. The federal hospitals are largely for the care of patients with chronic illness, and, in particular, female patients and children. They are controlled by a national committee composed of fifty women. These institutions are supported largely by proceeds of the Federal Lottery. Fifty per cent of total earnings are devoted to this charitable purpose. This sum is augmented by 10 per cent of the proceeds of the Jockey Club, derived from wagering on the horse races. Since the passion for gambling is prominent in the Latin soul, the Argentinian government believes that it is best controlled by giving it legitimate opportunities for gratification. Since the government derives enormous profits and the public is satisfied, this solution of the problem of hospital support is a very happy one. In fact, one wonders if it could not be adopted in succoring the financial anemia of some of our hospitals.

Tuberculosis Care Thorough

There is a large neurological institute which has an outstanding staff of scientific investigators. The care of pulmonary tuberculosis is on a large scale and is very thorough. A surprisingly large number of patients are subjected to phrenectomy, pneumothorax and thoracoplasty.

One criticism which I heard several of the clinicians make was that the clinical material in the various hospitals was divided into so many separate services that the amount in each service was limited to such an extent that the possibilities for clinical investigation were scarce.

Although the government has a very paternalistic attitude toward the medical indigent, no definite attempt has been made to set up state medicine as it exists in many of the European countries. The medical profession is not as closely organized as we are in our own country, but they have been able to exert considerable influence in a personal way and do not seem to fear the European form of state medicine. Some of the profession claim that investigation as to the ability of the patient to pay is very lax. There is comparatively little social service work being done there, although plans are being made to develop this field in the future.

The majority of the medical profession as a whole could be said to compare favorably with our own. There is a great desire for graduate training and in the future we will undoubtedly see many Argentinians visiting our clinics and attending medical meetings in North America. We should extend to them every available encouragement and coöperate with them to our fullest ability.

* * *

I have not referred to the short visit I made in Rio de Janeiro and Sao Paulo in Brazil, and to Montevideo in Uruguay. Sufficient time was not available for a thorough study of medical conditions.

In closing I can heartily recommend a trip to South America as being a most enjoyable and interesting one, and in many respects more instructive than a visit to Europe.

W. F. Braasch

Malpractice? Supreme Court Says "No"!

The Supreme Court of Minnesota has recently decided a malpractice case that we are sure will interest the medical profession. The opinion was written by the Honorable Harry H. Peterson, Associate Justice, and held that the plaintiff could not recover in that particular case.

The plaintiff sued a number of physicians in Minneapolis for malpractice, following a severe injury sustained in an automobile accident. The plaintiff suffered a fracture of the femur of the right leg which, as the Court pointed out, "is a very severe bone injury." The plaintiff suffered some discomfort and pain and a pressure sore on the heel from the cast. This work was done between December and the following March. Along in June of the same year the plaintiff developed an infection in the great toe on the right foot, resulting in amputation of a part of the toe.

Justice Peterson, in his opinion, stated that it was admitted that the defendants possessed the requisite skill and learning as physicians and surgeons. The question before the Court was whether or not they were negligent in applying their skill and learning in this particular case. The opinion points out that there was a total absence of any evidence that the practice by the defendants was not in accord with the usual and accepted medical standards. The opinion further points out that

"the highest degree of care was exercised in applying the cast and that notwithstanding such care in this case, as often happens in other cases, pressure sores unavoidably develop."

The Court held that a physician is not liable for injuries unavoidably resulting in spite of the exercise of due care, the Court pointing out:

"A physician or surgeon is only required to possess and exercise the degree of skill and learning ordinarily possessed by members of his school of the profession in good standing, and to apply that skill and learning with reasonable care and diligence and his best judgment."

The opinion further states that the defendants are not liable unless the plaintiff proves that the injuries complained of were the proximate result of negligent acts on the part of the physicians. The Court pointed out that the injuries, other than the heel sore and the pain resulting therefrom, and the stiffness in the leg, did not result from the treatment of the bone fracture; that the plaintiff was suffering from arthritis when he was admitted to the hospital. After the plaintiff failed in his proof of the charge of malpractice he advanced the theory of a technical assault and battery because the second cast was not put on the way the plaintiff thought it should be put on. The Court held that where a plaintiff proceeds against a physician on the basis of negligence and the matter is submitted to the Court upon that issue, he cannot thereafter, in a motion for a new trial, raise, for the first time, the question of assault and battery.

The decision of the Supreme Court was unanimous and the opinion written by Justice Peterson shows, very clearly, that the entire matter received the close scrutiny of the Court. The opinion contains many citations of other cases and a thorough discussion of the most minute details of the present case. A careful reading of the opinion indicates that same malpractice suits are instituted even though the facts and the law show, rather definitely, the absence of merit in the law suit.

This case was first tried in the District Court of Hennepin County before the Honorable Arthur W. Selover, Judge, and a jury. After hearing the evidence, Judge Selover was of the opinion that the plaintiff had not proved any malpractice against the defendants and consequently directed the jury to bring in a verdict for the physicians.

NOTE: Justice Peterson will be remembered by many members of the medical profession as an efficient and aggressive Attorney General of the State of Minnesota from 1933 until his appointment to the Supreme Court in December, 1936.

The Lay Demand For Medical Publicity

The medical Box of Pandora has been opened to the prying eyes of the laity and its medical secrets are now making the front page. It is difficult to pick up a magazine today which does not

contain an article pertaining to some phase of medicine.

When one reflects on the publicity given by the daily press alone, often in screaming headlines and written in sensational style, with its exaggerations and distortions of half-truths, one wonders if the old way of thinking would not be best for all concerned. While information concerning disease in certain fields may be of benefit to the public welfare, unless the subjects are carefully selected and written up by competent medical authorities, resulting misinformation may to a great extent overcome any good which might come from such publicity.

By Incompetent Writers

Unfortunately, many articles now flooding the periodicals are written by incompetent lay writers and in some instances by an incompetent medico. Under the guise of giving information to the layman, who has been "kept in abysmal ignorance throughout the ages," a choice lot of balderdash is being dished out to the gullible public. By using catch phrases and playing up sex features, popular interest is attracted and much of the misrepresentation and distortion of facts is believed. Some of these articles will have sensational headlines or illustrations which suggest criticism or inadequacy of the present methods of medical care. In some cases the substance of the article will correct this to some extent, but the casual reader will retain only the superficial impression.

Dressed Up to Catch the Eye

As an example of misinformation which is even worse than the secrecy of yore, attention is called to an article on prostatic disease which appears in the current issue of *Pictorial Review*. Written by a layman and dressed up to catch the public eye, it contains many statements which are controversial and far from exact. To give the article an air of authenticity, it quotes liberally from a well known authority on prostatic disease, so editing his remarks as to substantiate the text of the article. This may well serve as a warning to our profession to beware of the magazine interviewer and to inquire as to the purpose and scope of the proposed article. Circumstances may be such that a request by authorized reporters for information regarding medical subjects should be granted. If so, it is wise always to insist on editing the copy before publication, and not to contribute pictures of oneself in the course of an operation or examination.

Many similar articles can be cited. As a result of the mass of misinformation, the public probably will be more confused than it was before the campaign was started. Something should be done about this.

Relief Clients May Choose—Aufderheide

The month of January brought negotiations in many counties about medical relief for 1938.

In several, commissioners and boards of welfare disagreed with representatives of physicians as to the meaning of the clause in the Relief Law that provides "choice of vendor" to relief clients, providing the vendor lives up to regulations and qualifications.

The meaning of the law is clear. The State Relief Administration properly interprets it to refer to vendors of services as well as products, and will enforce that interpretation in every county that receives aid from the state to handle its relief problem.

In complying with this law it makes no difference how individual counties allocate their funds. They may choose to declare that medical relief bills are paid out of local funds and so hope to evade the law; but relief administrators do not recognize such distinctions and are prepared to refuse state aid to offending counties.

To Send Bulletin

A bulletin to this effect will go out shortly from Mr. Herman D. Aufderheide, State Relief Administrator.

Unfortunately the relief department does not feel that it can make the same demand for payment of the fees called for by the official S. R. A. fee schedule.

Fees Another Story

Mr. Aufderheide says that funds to pay the fees are adequate. The fees should be paid; but he cannot enforce payment. In several counties certain modifications have been made in confer-

ence between physician representatives of local societies and the county commissioners or welfare boards. In case of disagreement it appears to be a problem that can be settled only in such conferences. Happily the full schedule is being paid without question in many other counties. A questionnaire is going out from the State Office soon to every county in the state to find out exactly how satisfactory relief arrangements are in Minnesota.

Keener Vision

(Monthly Editorial by the Medical Advisory Committee)

An advertisement in a lay magazine advises that squinting, frowning, or scowling when using the eyes is usually an indication that the eyes need attention, better light, or both. Webster defines these words as follows:

To squint: to have the vision distorted.
To frown: to contract the brows in displeasure.
To scowl: to look sullen or angry.

The need of clearer vision and keener insight into the other man's problems has never been more apparent than in the cases reviewed by your Medical Advisory Committee during the last year.

The squint, the frown, the scowl each have a degree of meaning to the observant person. As the dissatisfied patient of another doctor hangs on every word of his present consultant, so he sees and registers every expression of pleasure or displeasure on the consultant's face.

The average consultant before a malpractice suit does not see the patient until several months after the original injury complained of. Therefore, before giving a positive opinion by look or word, would it not be advisable to obtain all the light possible on the case as procured by the first man, even to the point of a telephone call or personal interview with him?

An hour spent in the study of psychology and economics in the handling of patients could well become a part of every medical man's day.

Visiting President

Mrs. Augustus S. Kech of Altoona, Pennsylvania, is national president of the Women's Auxiliary and legislative representative and advisor of the Pennsylvania State Medical Society.

She visited the Twin Cities recently, talked to the Ramsey and Hennepin County auxiliaries, to a group of officers of the Minnesota State Medical Association, proved to everybody who met her that she is a person of unique charm, energy and a remarkable grasp of the political and economic problems of medicine.

Pennsylvania's Troubles

What she told the doctors about the difficulties of the Pennsylvania soicety in handling its cult problem was of especial interest to Minnesota.

Said Mrs. Kech in substance:

There is a Medical Practice Act in Pennsylvania; but it is not enforced. The result is that approximately 200 chiropractors are licensed under the Act and 2,700 are practicing without licenses and in defiance of the law.

(Compare these figures with Minnesota figures for chiropractors under the Basic Science Law, 1927 to 1937. In April, 1927, 592 were registered. Since then thirteen have passed the Basic Science examinations and three have registered by previous licensure. In 1937, however, only 398 were registered and any chiropractor who attempts to practice without a license is subject to prompt prosecution for violation of the law.)

The 2,900 chiropractors in Pennsylvania were assessed $100 each for legislation last year.

That produced a fund of approximately $300,000 for the chiropractors alone last year.

To combat it, the Pennsylvania Medical Society secured the services of twenty lay speakers, trained them and sent them out to talk to every group in the state, from the smallest sewing circle of ten persons to large public gatherings.

Every one of 141 cult bills was killed as a result of this intensive work, and in spite of the fact that the lower house of the Pennsylvania legislature was so organized that it was impossible for the physicians to work with it.

Auxiliary Help

The Auxiliary helped greatly by clipping newspapers and periodicals throughout the state for editorials, news stories, items of interest that bore in any way upon medicine or the legislative situation.

Minnesota State Board of Medical Examiners

Minneapolis Woman Sentenced to Five to Twenty Years at Hard Labor

Re: State of Minnesota vs. Myrtle L. Brandenburg.

Myrtle L. Brandenburg, who holds no license to practice any form of healing in the State of Minnesota, entered a plea of guilty on January 6, 1938, in the District Court of Hennepin County to an indictment charging her with manslaughter in the first degree. The defendant was sentenced by the Honorable Levi M. Hall, Judge of the District Court, to a term of five to twenty years at hard labor in the Women's Reformatory at Shakopee.

Mrs. Brandenburg, who stated she was thirty-seven years of age, and the mother of three children, performed a criminal abortion on a twenty-seven years old married woman who died from the effects of the abortion on November 23, 1937. The defendant resided at 664 Fourth Avenue, Northeast, Minneapolis, and has been under suspicion for some time for being in this type of criminal work. She admitted that she had performed other abortions, stating that she received $25.00 apiece for a few of them, but that most of the time she received from $5.00 to $10.00 per abortion. She also was practicing medicine unlawfully by furnishing pills and other medicines to the patients. She used a chromium plated catheter and elm bark as her chief weapons, and these were found by Minneapolis policewomen, hidden in the radio in the Brandenburg home.

Mrs. Brandenburg has had no medical training of any kind. This case again illustrates the terrific penalty paid by lay people who go to quacks who have no knowledge of anatomy or of the absolute necessity of sterile conditions. The prompt and effective disposition of the case is due, in great part, to the splendid work done by the Women's Bureau of the Minneapolis Police Department and the coöperation shown by the Coroner's office under Dr. Gilbert Seashore, and the County Attorney's office. The imposition of this sentence by Judge Hall should be a warning to a number of individuals in Minneapolis that the law does catch up to them and that the penalty can be made quite severe.

Distribution of Smallpox Vaccine

So far as very limited funds will permit, smallpox vaccine will be distributed for use in school or other public vaccination projects, the plans for which have been approved by the County or District Medical Society, and particularly in districts where smallpox has appeared. Requests for vaccine should be accompanied with a statement of facts and that the County Society approves the plans. The date on which the vaccinating is to be done and the number of persons to be vaccinated should be given.

It is important for all group immunizations, or in any case where the parents are not present, that the written consent of the parents be first obtained. Cards for such purpose will be furnished by this Department on request. Only as much vaccine as is immediately needed should be asked for and any unused tubes promptly returned.

The funds available for the purchase of vaccine are quite small. Vaccine must be kept at all times in an icebox. Its potency is less than 90 days. This Department cannot get any credit for outdated tubes nor can outdated tubes be exchanged for fresh vaccine. So the purchase price of an unused and outdated tube is a total loss. In consideration of these facts and the money available, it does not seem possible to furnish vaccine to physicians for use in their regular routine private practice.

MINNESOTA STATE DEPARTMENT OF HEALTH.

In Memoriam

Charles Patrick Dolan

1858-1937

DR. CHARLES P. DOLAN died at his home in Worthington, December 23, 1937 at the age of eighty.

Dr. Dolan's parents were among the early settlers in Waseca County, having homesteaded there in 1858. On the old farm, where his parents lived continuously to ripe old age, Dr. Dolan was born September 8, 1858. After attending the county grammar schools, Dr. Dolan later graduated from the high school at Waterville.

Beginning with a year in the office of Dr. E. P. Case of Waterville, Dr. Dolan received his medical degree from the University of Iowa, Iowa City, in 1880 and took a year of postgraduate study at Bellevue Hospital, New York City. Beginning practice in Waterville, he moved to Worthington in 1904.

On January 25, 1888, Dr. Dolan married Tillie McElvoy, a native of Illinois. Two children, Leo Dolan of Worthington and Marie (Mrs. Howard Thrush) of East Chicago, Indiana, survive.

Dr. Dolan has been one of the leading physicians of Nobles County since 1904, when he moved to Worthington, taking over the practice of his brother, Dr. Edward Dolan, who died that year. He was the first president and charter member of the local Kiwanis Club, vice president and one of the original members of the Southwestern Minnesota Sanatorium commission, and for many years county coroner and health officer for Worthington. He owned a cabin in northern Minnesota where he loved to seek diversion in hunting and fishing. During his many years of service, he had endeared himself to his many friends and patients.

Frank Benjamin Hicks

1860-1937

THE death of Frank Benjamin Hicks, of Grand Marias, Minnesota, who passed away at University hospital, Minneapolis, August 21, 1937, marks the closing of a pioneer medical career, which has been compared by many to that of Dr. Wilfrid Grenfell of Labrador.

Born May 3, 1861, at Tomah, Wisconsin, the eldest son of Rev. and Mrs. William C. Hicks, he first chose the ministry as his career. Making his own way, he graduated from Beloit Academy and later received his B.A. from Beloit College. From there he went to the Chicago Theological Seminary, graduating with his B.D. degree in 1888.

During summer vacations, he supplied in missions in the then Dakota Territory. While there he met Miss Ethel M. Barnes, a school teacher, whom he married in

August, 1888. His pastorates were near Chicago, enabling him to study at the University of Chicago, where he took his M.A. and Ph.D. degrees in history.

A man of vision, he was a bit before his time in that he wished to develop reading and recreational centers in the church. All such activities were considered undignified and not a part of a clergyman's affair by most church fathers. Mr. Hicks finally decided he could do more good for humanity in the practice of medicine. So, with his wife and four small children, he gave up his prosperous church and took two small missions outside Chicago, having only $200 in cash assets.

Preaching Sunday mornings at Genoa Junction, Wisconsin, and in the evening at Richmond, his wife taking charge of the evening service in Genoa and the midweek prayer meeting, Mr. Hicks went to Rush Medical College, graduating with honors in June 1898, in debt but a little over one hundred dollars.

In October, 1898, Dr. Hicks moved to Washburn, Wisconsin, where he began the practice of medicine.

In 1906, he moved to Grand Marais, Minnesota, as physician for the lumber camps. At that time there were thousands of men in the lumber camps and he visited each camp once a month unless called oftener. He supplied hospital care for those who needed it. These trips were made with horses and bob sled, or on horseback. A trip to the camps required three days' time.

In 1907, he was appointed government physician for the Indians of that district, a post which he held until his death. Until the last years of his life, he was never off duty for illness but four days and in all those years his only vacation was one of three weeks' duration.

In those days, travel by road in summer time was practically impossible and he made his trips by way of his small motor-boat up and down the shore on treacherous Lake Superior, often having narrow escapes with his life. Trips inland were made as far as possible on horseback or driving himself. Then taking a canoe he would paddle across a lake, and with the canoe on his back, his medicine case in his hand, make a portage of from three-fourths of a mile to three miles, launch the canoe and paddle on. On one of his calls he made fourteen such portages. In the winter, he used dog teams. At another time, he walked fifty-eight miles to the bedside of a very sick and penniless woman. He brought hundreds of children into the world and in spite of the crude conditions he had to work under, never lost a mother. He often had to act as a nurse as well as doctor. In a few instances, in the absence of another clergyman, he performed the burial service for those in out-of-the way places, and on one occasion also during a smallpox epidemic when the clergyman refused to officiate. For twenty-five years he was the only doctor within a radius of ninety miles. The large lumber camps were there but two years and after that the greater part of his work was done for "love of humanity."

In 1913, he was appointed by Governor Eberhardt to the Minnesota State Board of Medical Examiners, a position which he held for several years, acting as president for one year.

When the coast guard was instituted at Grand Marais he was made their physician.

Everything he could do for public good he did gladly. Largely through his efforts a high school was established in Grand Marais. The Congregational Church there was founded by him and later he was an important factor in the "good roads" movement.

He was passionately fond of music and his hospitality was a by-word among all who knew him.

By his side a constant source of help and encouragement through all the years, stood his wife.

Dr. Hicks is survived by his widow and four children: Dr. Harvey R. Hicks of Grand Marais; Mrs. Hester Temple of Blue Earth; Mrs. Celia Valentine of Ely; and Mrs. Elizabeth Roberts of Cleveland, Ohio. Mrs. A. Tymeson, of Minneapolis, is a sister.

It may well be said that here was a life dedicated to "Service," where any who asked might receive.

Mineral Oil in Foods

The Council on Foods reports that it is well known that liquid petrolatum is not absorbed from the gastro-intestinal tract, and that it yields no calories. Because of these properties, mineral oil is extensively used in the treatment of constipation and, to a lesser extent, in replacing fat in certain foods, chiefly mayonnaise and salad dressings, and a few other products. According to published reports mineral oil interferes with the utilization of vitamin A by experimental animals. Later reports indicated that the ingestion of mineral oil resulted in a considerable loss of vitamin A to the animal organism if the oil was administered with the source of vitamin A but not if the mineral oil was given at some other time of the day. It was also brought out that different results could be expected with different sources of vitamin A. It is apparent that liquid petrolatum would be a poor vehicle for vitamin A and particularly for provitamin A, and its use in this connection could not be countenanced. On the other hand, it appears that in the amounts usually prescribed and under the conditions which should be observed (not to be taken at mealtime), the effect of liquid petrolatum on the absorption of vitamin A of the human diet probably is of little consequence. When incorporated in foods, however, so that the mineral oil is taken at mealtime, it is obvious that there is danger of interference with the absorption of the fat soluble vitamins. The Council on Foods therefore advises strongly against any indiscriminate dosage of mineral oil either alone or incorporated in special foods. (Jour. A.M.A., Nov. 27, 1937, p. 1814.)

OF GENERAL INTEREST

Dr. C. A. Scherer, of Duluth, has been reappointed county health officer.

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Dr. A. L. Arends, of Askov, has moved to Sandstone, where he will practice medicine.

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Dr. William L. Wall has opened an office in Anoka for the practice of medicine.

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Dr. William Von Rohr Heise, son of Dr. and Mrs. W. F. C. Heise of Winona, has opened an office for the practice of medicine in Winona.

* * *

Dr. Arthur Neumaier, formerly on the staff of the Raiter Hospital and Clinic in Cloquet, has taken over the practice of Dr. C. P. Truog at Lindstrom.

* * *

Dr. Z. E. House and family, of Cass Lake, have returned from Florida, where they have spent some time. Dr. House will engage in private practice.

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Dr. P. F. Meyer, of Faribault, has been reappointed county physician, health officer and member of the county board of health.

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Dr. T. J. O'Leary, of Duluth, has been appointed president of the St. Mary's Hospital executive committee, by the governing Sister body.

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Dr. J. E. Arnold, formerly of Miles City, Montana, has been appointed school doctor and village health officer of Mountain Iron.

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Dr. E. J. West, who has been associated with the Arrowhead Clinic for the past ten years, has opened offices in Faribault for the general practice of medicine.

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Dr. Kee Wakefield, of Minneapolis, formerly of Hutchinson, celebrated his ninety-fifth birthday on December 28.

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Dr. E. V. Strand of Bayport recently returned from a trip East. Doctor Strand spent about six or seven weeks at the Polyclinic Hospital in New York.

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Dr. C. T. Berger, formerly of Britt, Iowa, has opened an office in Blue Earth for the practice of medicine. Dr. Berger is a graduate of the University of Minnesota School of Medicine.

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Dr. E. M. Jones, of Saint Paul, was the guest speaker at the regular meeting of the Washington County Medical Society on January 11. He spoke on "Abdominal Adhesions."

Dr. W. R. Bagley, of Duluth, who has been associated with movements for the conservation of natural resources in Minnesota and the Northwest, was endorsed for the 1937 Duluth American Legion Hall of Fame by the West Duluth Business Men's Club.

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Dr. Paul A. O'Leary, of Rochester, attended the meeting of the Coöperative Clinical Group for Research in Syphilis, and a meeting of the syphilis committee of National Research council held in Washington, D. C., early in January.

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Dr. Ralph T. Knight, Minneapolis, has been appointed Director of the Division of Anesthesia at the University Hospital, and since December 1 has been also supervising the Department of Anesthesia at the Charles T. Miller Hospital, Saint Paul.

* * *

Dr. H. I. Lillie, of Rochester, attended the council meeting of the American Laryngological, Rhinological and Otological Society in New York early in January. He is president-elect of the Society and will attend an eastern section meeting of the organization in Philadelphia.

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Dr. Maurice B. Visscher, professor of physiology at the University of Minnesota, was the principal speaker at a meeting of the Ramsey County Medical Society held on December 27. The question of how physiological methods and ideas can be applied to the problem of a failing heart was discussed.

* * *

At a special meeting of the Wabasha County Medical Society held at Lake City on the evening of January 4, Dr. Rudolph C. Logefiel of Minneapolis delivered an illustrated address on "Gastric Diseases and the Use of the Gastroscope," with demonstrations of the modern instrument.

* * *

There are a few vacancies at present and in prospect for duty with the CCC in this military district. This medical service is rendered by Reserve Officers or by civilian physicians, who enter into contract with the Surgeon, Seventh Corps Area, who may be addressed at the Federal Building, Omaha, Nebraska.

* * *

The Interurban Academy of Medicine met in Duluth on January 19. Dr. Russell Best of Omaha, Nebraska, spoke on "Some Newer Surgical Aspects of the Biliary Tract," and motion pictures showing various phases of arterial sclerotic heart disease and changes in the stages of development were presented by Drs. Gage Clement and R. L. Nelson, both of Duluth.

* * *

The Milwaukee Sanitarium announces the appointment of Dr. Lloyd H. Ziegler as Associate Medical Di-

rector. Dr. Ziegler received his M.D. degree at the University of Minnesota, and was formerly staff consultant in neurology and psychiatry at the Mayo Clinic. He has studied clinical methods extensively in this country and abroad.

* * *

A Division of Neurosurgery in the Department of Surgery was established last summer at the University Medical School with Dr. William T. Peyton, Associate Professor of Surgery, as Director. The other staff members appointed to the Division were: Dr. J. Frank Corbett, clinical professor; Dr. A. A. Zierold, clinical professor; Dr. George R. Dunn, clinical assistant professor, and Dr. Wallace P. Ritchie, clinical assistant.

* * *

Dr. Charles K. Petter, formerly at Glen Lake Sanatorium, Oak Terrace, Minnesota, has moved to Waukegan, Illinois, where he is the Medical Director of the Lake County Tuberculosis Sanatorium Board. The Lake County Tuberculosis Sanatorium Board expects to begin the construction of a new sanatorium in the spring, and Dr. Petter will be the director of that institution.

* * *

Dr. Louis E. Jones, physician in charge at the St. Croixdale Sanatorium, passed away early in January. He was a graduate of Brown University, and received his M.D. degree at the University of Minnesota in 1924. He served his internship at St. Barnabas and University Hospitals. Dr. Jones has practiced continuously at Prescott, Wisconsin, where, in 1925, he opened the hospital which later became known as St. Croixdale Sanatorium. Dr. Jones was thirty-nine years of age, unmarried, and is survived by his mother and sister.

* * *

Dr. and Mrs. H. P. Wagener and Dr. and Mrs. Norman M. Keith, of Rochester, have returned from Europe. Dr. Wagener and Dr. Keith were delegates to the International Congress of Ophthalmology, held in Cairo, Egypt. Because of illness, Dr. Keith was obliged to remain in Amsterdam while Dr. Wagener continued the journey to Cairo, where he presented a paper by himself and Dr. Keith. Dr. Wagener also conducted a symposium on the relation of high blood pressure to the eye, and the general nature and connection between the two. He visited several eye hospitals in Egypt, where the principal problem is the treatment and prevention of trachoma.

* * *

The thirty-fourth annual Congress on Medical Education and Licensure will be held at the Palmer House, Chicago, February 14 and 15. The first day will be devoted to a report of the Council on Medical Education and Hospitals with papers covering general subjects pertaining to licensure, medical examining boards, curricula in medical schools, limitation of student enrolment. On Tuesday morning a symposium on Graduate Medical Education will be presented. At a joint session of the Council on Medical Education and Hospitals and the Federation of State Medical Boards, Tuesday afternoon, a symposium on Promulgation of Regulations Authorized by Law will be presented.

Special Convention Tour

The thought that the forthcoming A.M.A. Convention in San Francisco, June 13 to 17, is a splendid opportunity for a tour of the United States both going out and coming back, has inspired definite action. The coöperation of more than twenty-five state medical societies has made it possible to arrange a special train tour which will include the Indian Detour, the Grand Canyon, Los Angeles, Riverside and Santa Catalina Island—on the way out to San Francisco. A choice of two return routes is possible, one of which visits the cities of Portland, Seattle, Victoria and Vancouver and the scenic spots of the Canadian Rockies; the second route travels via Yellowstone National Park, Salt Lake City, Royal Gorge, Colorado Springs, and Denver.

There is an all-inclusive price for this tour which includes transportation from home town to home town, though the tour starts officially at Chicago, on Monday, June 6, from which point an American Express escort will join the group, as this travel company has been appointed transportation agent and the business details of the trip are in their hands.

Further information concerning the tour may be found elsewhere in this issue.

Sigma Xi Lecture Series

"Man and His Diet" will be the general subject of the eleventh annual lecture series by members of the University of Minnesota faculty given under the auspices of the Sigma Xi honorary scientific society this month.

The lectures will be given at 8:15 o'clock each Friday evening in Northrop Memorial Auditorium and will include the following speakers:

February 4—"The Fundamentals of Nutrition"
Dr. LeRoy S. Palmer, Professor of Agricultural Biochemistry, University Minnesota

February 11—"The Feeding of the Child"
Dr. Chester A. Stewart, Clinical Professor of Pediatrics, University of Minnesota

February 18—"Fads, Fancies and Fallacies in Adult Diets"
Dr. R. M. Wilder, Professor of Medicine and Chief of Department of Medicine, Mayo Foundation, University of Minnesota

February 25—"The Food Industries of Minnesota"
Dr. Clyde H. Bailey, Professor of Agricultural Biochemistry, University of Minnesota

Preceding each lecture a half hour's program of music will be given by the University Symphony Orchestra under the direction of Professor Abe Pepinsky.

REPORTS and ANNOUNCEMENTS

MINNESOTA HOSPITAL ASSOCIATION

The 15th Annual Convention of the Minnesota Hospital Association, together with eight allied organizations, will be held at the Nicollet Hotel in Minneapolis on May 19, 20 and 21, 1938. The allied organizations consist of the following:

Minnesota Anesthetists Association
Minnesota Dietetic Association
Minnesota Record Librarians Association
Minnesota Society of Medical Technologists
Minnesota Occupational Therapists Association
Minnesota Chapter of the American Physiotherapy Association
Minnesota District of the American Association of Medical Social Workers
Minnesota Association of Hospital, Medical and Institution Librarians

It is expected that the total attendance at this gathering will be about seven hundred and fifty.

* * *

MEDICAL BROADCAST FOR FEBRUARY

The Minnesota State Medical Association Morning Health Service.

The Minnesota State Medical Association broadcasts weekly at 9:45 o'clock every Saturday morning over Station WCCO, Minneapolis and Saint Paul (810 kilocycles or 370.2 meters).

Speaker: William A. O'Brien, M.D., Associate Professor of Pathology and Preventive Medicine, Medical School, University of Minnesota. The program for the month will be as follows:

February 5—Infant Feeding.
February 12—Scarlet Fever.
February 19—Asthma in Children.
February 26—Gingivitis.

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DOUGLAS COUNTY MEDICAL SOCIETY

The Douglas County Medical Society has elected Dr. J. C. Kyllo president for the coming year. Other officers are Dr. C. W. Mason, vice president, and Dr. S. H. Perrin, secretary-treasurer.

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SCOTT-CARVER COUNTY MEDICAL SOCIETY

The Scott-Carver County Medical Society met at Mudcura Sanitarium, Shakopee, on January 11.

Dr. Willard White of Minneapolis spoke on "Treatment of the More Common Fractures." Dr. Owen Robbins of Minneapolis spoke on "Problems in Prenatal Care."

* * *

WASHINGTON COUNTY

The Washington County Medical Society held its regular monthly meeting January 11. The scientific program was given by E. Mendelssohn Jones, M.D., of St. Paul. The subject was "Abdominal Adhesions" and was very interesting, practical, and well illustrated by x-rays.

Due to the smallpox situation in the state, the Society put a notice in the newspapers advising people to be vaccinated.

* * *

WINONA COUNTY MEDICAL SOCIETY

Dr. Robert B. Tweedy, of Winona, was elected president of the Winona County Medical Society at the annual meeting. Other officers elected are Dr. H. J. Roemer, vice president; Dr. Irving W. Steiner, secretary; and Dr. L. I. Younger, treasurer.

Speakers at the meeting included Dr. Herman E. Hilleboe of Saint Paul, who talked of the work being done in this state for crippled children, and Dr. Morse J. Shapiro of Minneapolis, who spoke on heart disease among children.

* * *

CENTER FOR CONTINUATION STUDY, UNIVERSITY OF MINNESOTA

Advance Registration

Advance registrations are now being received for the winter and spring medical institutes. During the past year, medical institutes were held in: Traumatic Surgery, Obstetrics and Gynecology, Pediatrics, Internal Medicine, Roentgenologic Diagnosis, Disease of Heart, Surgical Diagnosis and Treatment, Dermatology and Syphilology and Ophthalmology and Otolaryngology. During the remainder of the scholastic year 1937-1938, institutes will be offered in Medical Diagnosis and Treatment, Traumatic Surgery, including fractures and dislocations, Endocrinology, including disorders of metabolism, Disease of Rectum and Colon and Roentgenologic Diagnosis.

Nearly 230 physicians have attended the institutes. An advance registration sufficient to guarantee a complete program as outlined above has been received. As enrollment in future institutes will be limited, physicians planning to attend should register as soon as possible. It is also helpful in planning programs to know the interests of the group in advance.

Many physicians in Minnesota and the Northwest are still unfamiliar with what the Center for Continuation Study has to offer. Under the directorship of J. N. Nolte, advanced courses of study have been offered in coöperative management, nursery teacher training, pharmacy, probation and parole problems, social welfare administration and supervision, waterworks operation, hospital administration, adult education, photography, international relations, architectural concrete, Scandinavian culture, police training, parent-teacher

leadership, traffic safety, structural engineering, educational guidance, general collegiate education, religious and ethical philosophy, trade and industrial coördination in education, technic of writing, family welfare administration and supervision, library practice and problems, Boy Scout executive leadership and medicine. For the future, a list of subjects similarly diverse is under consideration.

The Center has proved an ideal place in which "To live and learn." With accommodation for seventy-eight persons in comfortable, well-furnished rooms, every need of the postgraduate physician is satisfied under one roof. The majority of lectures are given in the Center with clinics in the University of Minnesota and affiliated hospitals. As postgraduate physicians make a personal sacrifice in giving up their practices, the Center for Continuation Study is attempting to do its part by offering full programs of practical instruction and good living at the lowest possible price.

Advance Program

Medical Diagnosis and Treatment. February 7 to 12, 1938. Lectures, clinics, demonstrations and therapeutic conferences on diseases of the gastrointestinal and respiratory tracts, the blood and blood forming organs.

Traumatic Surgery, including fractures and dislocations. March 7 to 12, 1938. Clinics will be held in the hospitals followed by lectures and conferences at the Center. Dr. Wallace H. Cole and associates. Enrollment limited to 25 students.

Endocrinology, including disorders of metabolism. April 4 to 9, 1938. Treatment of obesity, diabetes and the more common disorders of the endocrine glands, including the thyroid, uterus and ovary. Dr. J. C. McKinley and associates. Enrollment limited to 30 students.

Disease of Rectum and Colon. May 2 to 7, 1938. Clinics and demonstrations followed by lectures and conferences. Dr. Walter A. Fansler and associates. Enrollment limited to 15 students.

Roentgenologic Diagnosis. June 6 to 11, 1938. One of the popular institutes of last year. Arranged primarily for physicians who use their own apparatus for roentgenologic diagnosis. Dr. Leo G. Rigler and associates. Enrollment limited to 30 students.

Information

Write at once to J. N. Nolte, Director, Center for Continuation Study, University of Minnesota, for registration details and room reservations.

WOMAN'S AUXILIARY

Mrs. J. F. Norman, Crookston, *President*
Mrs. A. A. Passer, Olivia, *Editor*

UNDER the direction of the State President, Mrs. J. F. Norman, and the Chairman of Organization, Mrs. W. B. Roberts of Minneapolis, three medical auxiliaries were organized in the fall of 1937. On October 7, a Woman's Auxiliary for Wabasha County was organized with the following officers elected: President, Mrs. B. A. Flesche, Lake City; vice president, Mrs. J. A. Slocumb, Plainview; secretary, Mrs. G. W. Holt, Wabasha; treasurer, Mrs. D. A. Burlingame, Mazeppa. On November 18 the Winona Auxiliary was organized with the following officers: President, Mrs. C. P. Robbins, Winona; vice president, Mrs. H. W. Satterlee, Lewiston; secretary, Mrs. A. E. Meinert; treasurer, Mrs. L. J. Nilles, Rollingstone. Eighteen members joined this group. On December 9th the medical society of Clay-Becker voted to have an auxiliary and Mrs. Norman organized the auxiliary at that time with six members present. The following officers were elected: President, Mrs. O. O. Larson, Detroit Lakes; vice president, Mrs. E. K. Ingebrigtson, Moorhead; secretary-treasurer, Mrs. L. H. Flancher, Lake Park. We cordially welcome these new units and wish them a happy, active role on the honor roster. We now have twenty-four active women's auxiliaries in the state.

The midwinter board meeting of the State Medical Auxiliary was held at the Woman's Club of Minneapolis, on Friday, January 14, at 10:30 A. M. Mrs. J. F. Norman, Crookston, state president, presided at the business session, at which time a nominating committee was elected, and plans were heard for the state meeting to be held in Duluth June 29, 30, and July 1. Mrs. Augustus S. Kech of Altoona, Pennsylvania, president of the National Women's Medical Auxiliary, was the honor guest of the meeting and was the luncheon speaker to which all members of the Women's Auxiliary were invited. Reservations for the luncheon were in charge of Mrs. W. W. Moir, Minneapolis, former president of Hennepin county. Mrs. Martin Nordland of Minneapolis, a former state president, gave a tea at her home on Saturday, January 15, in honor of Mrs. Kech.

Hennepin County Auxiliary

The regular monthly meeting was held at the Hennepin County Medical Library on January 7. "Community Health Service" was discussed by Miss Laura Draper. Mrs. Edward Kelly, well known Minneapolis artist, gave a talk on "An Artist's Summer in Mexico," at the February meeting. A program of music was furnished by Mrs. H. P. McCrimmon, violinist.

Olmstead-Fillmore-Houston-Dodge Auxiliary

At the auxiliary meeting held in November, Mrs. L. M. Randall of Rochester, president, presided. Miss Priscilla Keely, social service worker at the Mayo Clinic, and Miss Jose Bosly, visiting nurse, spoke. Mrs. W. C. MacCarty of Rochester, district chairman of the Woman's Field Army for the Control of Cancer, also presented a report. Mrs. F. P. Moersch of Rochester was hostess to the auxiliary at her home on January 6. Mrs. L. M. Randall reported on activities of the state auxiliary at the American Medical Association meeting last year.

PROCEEDINGS of the MINNEAPOLIS SURGICAL SOCIETY

Stated Meeting, December 2, 1937

The President, Dr. O. W. Yoerg, in the Chair

THE OPERATIVE TREATMENT OF HYPOSPADIAS

With a Report of Three Cases in Brothers

C. D. Creevy, M.D.

Abstract

Dr. Creevy reported three cases of penoscrotal hypospadias in brothers aged six, fourteen and sixteen years; their father stated that two maternal uncles had similar deformities. The three were operated upon successfully in two stages. The first operation straightened the penis, the second constructed the urethra. A urethral fistula resulted in the oldest boy, and was closed by a third operation; in the others healing was by first intention.

The speaker discussed the various operations proposed and used for hypospadias, after pointing out that the glandular variety required no treatment, while the penile, penoscrotal and perineal varieties needed operation to relieve the functional impotence and sterility resulting from the ventral curvature of the penis and the misplacement of the external urinary meatus.

He advocated the Duplay operation for straightening the penis, and doubted whether the more elaborate proceedure of Edmunds was often required, since satisfactory straightening was secured in twelve cases, while reoperation was needed in the thirteenth. The importance of diverting the urine from the operative field during healing, either by urethrostomy or by cystostomy, was emphasized.

Of the numerous methods advocated for construction of the urethra, that of Thiersch seems most practical, while the methods of Cabot and of McIndoe are useful in certain cases. In the Thiersch operation as modified by Cecil, the new urethra is constructed from the skin of the inferior surface of the penis sutured around a sound, so that the suture line adjoins the corpus cavernosum along the roof of the urethra. The new tube is covered by a flap of penile skin pulled across it so that the external suture line lies at a distance from that in the urethra.

In two of the three cases reported, the urethra was constructed in one stage; the third required a second stage to close a fistula, but most of the other operations regularly require two stages for the construction of the urethra.

Discussion

Dr. Ivar Sivertsen: I feel as though I bring coal to Newcastle when I try to discuss a paper such as was delivered by Dr. Creevy. Most of us do not see these cases, not very many of them, at least. We probably see the penile type of hypospadias which, as Dr. Creevy says, is not of much consequence. The only treatment necessary, here, would probably be either a dilatation or even a little incision with a suture of the mucous membrane to the glans penis.

I have seen only one case of the penile type and it had a large roof of mucous membrane which it was possible to dissect away from the side of the penis and bring over a catheter. We obtained in this way a fairly good result except that a small fistula resulted which was later cured.

As to the time of operation in these cases, it seems to me that the best time to operate is before puberty. Some recommend that they be operated upon between the sixth and the tenth year. I don't know that Dr. Creevy mentioned that it makes any difference. Certainly, in the penile type of case where it is necessary to straighten the penis you have to separate the corpora cavernosa from around the urethra. Most men, I think, bring the penis up on the abdominal wall after they have made such a dissection of the corpora cavernosa and then probably do a cystostomy. I don't know which is the better procedure. Dr. Creevy certainly is a master in this work and it is not for me to say. The only cases we have seen we did do that very thing. I have not had any experience with the perineal type but I am sure that it is a very difficult procedure.

There was one operation, however, the Bucknell operation, that he spoke about, that has been modified by an Englishman where they used the prepuce of the penis and split that and brought it down upon the surface of the scrotum after making an incision on the scrotum and using the mucous surface of the prepuce as the floor of the urethra. To me, this appears to be a very satisfactory way. After doing this they wait some weeks and then do a modified Bucknell operation and apparently get good results. I don't know whether Dr. Creevy has seen this operation, the so-called Winsberry-White modification of the Bucknell operation. There, you will get tissue that is without hair and it can be brought up against the roof of the urethra.

Most men feel that unless you have a very definite reason for performing these operations, as in the so-called perineal hypospadias, they had better be left alone unless they can be done by an expert. I don't know but what I would leave them alone unless I could send them to Dr. Creevy. The penile type, of course, can be improved by the so-called Winsberry-White modification of the Bucknell operation.

I certainly want to congratulate Dr. Creevy on his very beautiful demonstration of this procedure, and I am very happy to have had the privilege of listening to his paper.

Dr. Kenneth Bulkley: I would like to know what Dr. Creevy thinks about the most suitable age for the operative procedure on these cases?

Dr. C. D. Creevy: Dr. Sivertsen mentioned an important point that I neglected to speak about in connection with the straightening of the penis. In the extreme degrees of deformity the intact part of the urethra just behind the hypospadiac meatus may also be shortened and in this particular variety it is very helpful to dissect the urethra completely free from the corpora cavernosa. One then circumscribes the meatus by a circular skin incision, lets the urethra re-

tract beneath the skin, and makes a buttonhole in the skin further back for the meatus.

As for the best age for operation, it is usually said that the penis ought to be straightened whenever the patient is first seen, and that the construction of the urethra ought to be put off until the penis has become large enough to make the operation a simple matter. Early correction of the deformity is urged because, as time goes on, the ventral surface of the corpora cavernosa becomes shortened and the deformity may be permanent. However, I have operated on a man of twenty-five, and didn't find it any more difficult to straighten the penis than in very young children. As a matter of fact, because of the size of the structures, it was considerably easier, so that I am not sure that there is any particular advantage in straightening the penis early in life.

HEPATIC CIRRHOSIS

Talma-Drummond-Morrison Operation

R. R. Cranmer, M.D.

Most classifications of liver cirrhosis are not wholly satisfactory. The following classification is based on the condition of the liver and the presence or absence of certain findings as ascites, portal vein obstruction, jaundice, and enlargement of the spleen.

1. Atrophic cirrhosis, hobnail liver, Laennec's cirrhosis, alcoholic cirrhosis.
   In this type the liver is rough and nodular, tends to be smaller than normal, there is marked portal obstruction with ascites and enlarged spleen, and no jaundice.
2. Obstructive biliary cirrhosis.
   Liver enlarged, smooth or granular. Jaundice present with clay colored stools. Usually no ascites but spleen may be enlarged.
3. Hypertrophic or Hanot's cirrhosis.
   Liver large and smooth. Jaundice but bile stained stools. No ascites, splenic enlargement.
4. Tuberculous and syphilitic cirrhosis.
   In addition Banti's disease (splenic anemia) is considered by some to be in reality another form of this condition in which the blood changes are marked, due, in large part, to massive hemorrhages.

Many things have been blamed as the cause of liver cirrhosis. Chronic alcoholism seems to be the thing most generally considered responsible. Arsenic and copper have frequently been mentioned. About 50 per cent of patients with cirrhosis give the history of alcoholic addiction. Perhaps, many of the remaining 50 per cent are users of it but do not admit it. Postmortems done on 134 chronic alcoholics in one large institution showed cirrhosis in only six.

Splenomegaly and ascites, with or without jaundice, depending upon the type, are the outstanding features in the advanced cases. Men present this condition about four times as frequently as women.

Conditions simulating liver cirrhosis and requiring differential diagnosis are: abdominal carcinoma, cardiac disease, tuberculous peritonitis, and, in women, large ovarian cysts.

The ascites in cirrhosis has been generally considered to be due to portal obstruction within the liver with resulting back pressure and accumulation of a transudate in the peritoneal cavity.

Others believe that following this the ascites is increased by congestion-excited endothelial cells pouring out an exudate.

Many of these cases have a coexisting myocardial insufficiency which may also be an etiological factor.

Toxins generated in the intestinal tract and spleen, when not removed by the liver, are thought by some to be the cause of the endothelial stimulation.

If the ascites is due to portal obstruction and also, in part, to the presence of toxins in the circulation causing stimulation of the endothelial cells of the peritoneum, any operation looking toward a cure should be one that reduces the obstruction and reduces the toxemia. If the toxins have their origin in the spleen its removal or the establishing of collateral circulation through adhesions produced between it and its contact peritoneum should be logical treatment.

The long continued portal obstruction results, in many cases, in dilatation of anastomosing venous systems uniting the portal with general circulation.

These anastomoses occur:

1. Between the coronary veins of the stomach and lower esophageal veins, the later opening into the right azygos and intercostals.
2. Between the branches of the inferior mesenteric vein, the superior hemorrhoidal and the branches of the internal iliac veins, the middle hemorrhoidal.
3. The veins of Retzius which originate in the walls of the intestines, and through a small trunk open into the ascending vena cava.
4. Anastomosis of veins about the umbilicus (caput medusæ).

Surgical procedures are aimed at:

1. Establishing collateral circulation
2. Reducing the portal bed
3. Draining the ascitic fluid.

Omentopexy suggested first by Talma and carried out by many others, including Drummond and Morrison, has been a popular procedure. This, in conjunction with the production of adhesions between the liver and peritoneum and between the spleen and peritoneum, constitutes the more modern operation known as the Talma-Drummond-Morrison operation.

Operations to reduce the portal bed are splenectomy and enterectomy. The last named operation described by M. K. Fuller of Chicago and her associates, in the *Surgery, Gynecology and Obstetrics* of September, 1937, consists of removal of several feet of small bowel. Basis for enterectomy in this condition is the hypothesis that obliteration of part of the portal bed by resection

of several feet of small intestine might decrease the returning venous blood to an amount which might pass through the cirrhosed liver, thereby decreasing the pressure in the portal veins and capillaries, and diminishing the transudation from the portal system into the peritoneal cavity.

Operations for the drainage of the ascitic fluid are, of course, palliative in nature.

Paracentesis continues to be the most practical of these. Eck's fistula, while ideal theoretically, is of no practical value because of the technical difficulties of the operation and high mortality associated with it.

Spheno-peritoneal anastomosis has been successfully done with good results in a few cases.

Case Report

The patient, a male, aged fifty-five, entered the hospital on March 1, 1935. His chief complaint was distention of abdomen, anorexia, nausea, general weakness, loss of weight, and pains in calves of legs.

Family history was essentially negative, no member of the family having had a similar condition.

The patient had the usual diseases of childhood. He had pneumonia two years previous to his admission. There was no history of scarlet fever or rheumatic fever. Genito-urinary history was negative except for gonorrhea fifteen years previous. He had been addicted to drinking for a period of thirty years and during the last twenty years averaged a pint of hard liquor daily. He dates the onset of his illness July, 1934, when he first became faint and dizzy upon exertion. Following this there was a loss of appetite and weight. He, then, noticed a distention of the abdomen which was progressive. His weakness increased until six weeks previous to his admission it became necessary for him to stop his work. He noticed that the urine was dark and that the stools were occasionally light yellow. There was no apparent jaundice.

Physical examination revealed that the patient was a moderately well developed man who did not appear acutely ill. There was no appearance of jaundice. Heart and lungs were normal. Abdomen was considerably distended. It was impossible to palpate the liver or spleen satisfactorily. There was no abdominal tenderness and no palpable masses. There was no edema of ankles. Varicosities of abdominal walls especially noticeable over right side extending into the chest. Blood examination showed hemoglobin 65 per cent; 3,200,000 red blood cells and 5,700 white blood cells per cu. mm.; pmns. 74.8 per cent, lymphocytes 25 per cent. Urinalysis revealed 1015 specific gravity; urobilin, 1 plus; urobilinogen, faint trace; occasional hyalin and granular casts; 2 to 4 pus cells; and no red blood cells. Quantitation urobilinogen test showed .44 mg. in twenty-four hours. Icteric index was 13. Urea nitrogen 7 mg. per 100 c.c. Galactose liver function test showed a total urinary output of 79 per cent of sugar in five hours.

Diagnosis: Cirrhosis of liver with ascites.

The patient remained in the hospital four weeks before operation, during which time abdominal paracentesis was done several times. The amounts of fluid removed ranging from 1,500 to 4,000 c.c. Following paracentesis, the lower edge of the liver could be felt for a distance of three fingers breadth below the costal margin. The spleen was easily palpable. The fluid was amber in color. His condition after a month's rest seemed slightly improved although there was no diminution in the amount of ascitic fluid accumulating. On May 2, following a paracentesis a Talma-Drummond-Morrison operation was performed under general anesthesia. The abdomen was opened through an upper left rectus incision and about a liter and a half of straw colored fluid was aspirated. The liver was enlarged to three fingers below the costal margin. Its edge was sharp and the surface was finely granular. The spleen was enlarged about three times the normal size. The upper surface of the liver was roughened by dry gauze spread over the fingers. The under surface of diaphragm was treated in a similar way. A similar procedure was carried out on the outer surface of the spleen and its contacting peritoneum. The anterior surface of the omentum was sacrificed, as was, also, the parietal peritoneum covering the anterior wall, for a distance of about seven centimeters lateral to the wound edges. The entire anterior surface of the omentum was sutured to the anterior abdominal wall and the wound was closed. The patient left the hospital June 4 with a small amount of ascitic fluid present in the abdomen. There was no paracentesis done following operation. Two months after his discharge very little fluid was present in the abdominal cavity and in four months time it had entirely disappeared. He returned to work about six months after the operation.

Discussion

DR. E. A. REGNIER: I think Dr. Cranmer is to be congratulated in presenting a patient with cirrhosis who is apparently in such good health. Our results in treatment of ascites associated with cirrhosis by the Talma-Morrison operation have not been good; in fact, they have been so discouraging that in the event of an apparent recovery one always is inclined to doubt that he was dealing with a true cirrhosis. The cause of the ascites is still very debatable. If it is due to a toxin the progress of the disease is not affected by any surgical operation. The case presented here this evening has obviously been completely relieved of ascites, which has brought him great bodily comfort and this good result certainly justifies the procedure. My own experience in this field has been very limited. I have one case relieved of ascites five years after operation. This was a case of cirrhosis associated with Banti's disease in a young girl, nine years old, in whom a splenectomy was done five years ago. She has remained well following splenectomy and omentopexy for the relief of ascites. One must not lose site of the fact that we are not treating cirrhosis but are operating to relieve a very annoying symptom, namely ascites, and the progress of the disease is not altered by this procedure.

DR. RALPH KNIGHT: I would like to ask Dr. Cranmer if the abdominal veins are now distended?

DR. KENNETH BULKLEY: Has the size of the liver changed any?

DR. R. R. CRANMER: No, the veins are not distended. I would like to say that one of the best papers I have ever read in connection with this type of thing is one written by Dr. Earl Hendrickson. He reviewed all the literature very thoroughly and it was published last year in the *Archives of Surgery*. I do not believe you can see any dilated veins here now. Here is the incision, a left rectus incision, and here especially is where he had quite a few dilated veins, over the chest and right side of the abdomen.

Replying to Dr. Bulkley's question, we had him on the table a couple of days ago and we could feel the edge of the liver at least two fingers below the costal margin.

In the Talma-Morrison operation the idea is to produce collateral circulation by adhesions between the liver and peritoneum on the under-surface of the dia-

phragm and between the spleen and peritoneum and if good collateral circulation results in these locations and between the omentum and the abdominal wall, any dilated veins on surface should disappear.

DR. C. E. MERKERT: I would like to ask whether the formation of adhesions in this operation actually does drain the abdominal cavity by forming new veins or is it through the lymphatics that are connected as in the Kondoleon operation for elephantiasis of the leg?

DR. R. R. CRANMER: I believe it is in the new veins.

OBSCURE RETROPERITONEAL ABSCESS

VERNE CABOT, M.D.

Miss A. O., a school teacher, unmarried and thirty-one years of age, entered the hospital September 11, 1936, with a history of illness for the past five weeks consisting of weakness, abdominal distress and fever, associated with severe anorexia but without nausea or vomiting. She was a rather small woman in moderate state of nutrition though showing the effects of a prolonged and severe illness.

Her previous history was of special import in that fourteen years ago she had undergone surgical intervention for appendiceal disease with abscess which was drained. Her postoperative period was very stormy and during her ninth postoperative week she was again submitted to abdominal incision for secondary abscess and again in her tenth week a deep abscess in the right lower lumbar region was also evacuated. From these surgical procedures she apparently convalesced until her eleventh week, when she suffered a siege of pneumonia, from all of which she recovered and was discharged from the hospital after fifteen weeks. She states that her health has not been robust since this period. She has tired easily and has been subject to backache for which she had been treated under the diagnosis of spinal arthritis (lumbar). The school-year of 1935-1936 she did not teach because of poor general condition. The summer of 1936 was spent in resting until in mid July when she became acutely ill complaining of indefinite abdominal discomfort with weakness and fever which had persisted to the time of our first seeing her when she was admitted to the hospital.

On admission, examinations showed a moderately tender lower right abdomen with greatest intensity along the anterior margin of right ilium downwards from the superior iliac spine for a distance of about 10 cm. and extending mesially for about 2 cm. There was no appreciable muscular rigidly. Other examinations of the abdomen and pelvis were essentially normal. There was slight pain on complete extension of the right thigh, which she attributed to the position she had assumed during her illness and to her chronic arthritis. There was no undue tension or tenderness over her lumbar areas. Her weight had dropped from 116 to 92 pounds the past year.

Temperature 102.6; pulse 78; respirations 18.

Blood studies: Hgb. 76 per cent; r.b.c. 4,250,000; w.b.c. 18,400. Repeated w.b.c. ranged from 12,000 to 22,000 with an average of 80 per cent pmns. Numerous urinalyses were at all times normal. The blood Wassermann and Mantoux tests were negative.

Roentgen studies of chest and urinary tract with pyelograms revealed no abnormalities. Gastrointestinal studies showed normal findings except for a very low lying cecum somewhat fixed and tender. The appendix was not visualized. Detailed x-ray studies of skeletal systems of chest, lumbar and pelvic regions were negative for osseous changes though there was a slight scoliosis of the lumbar region and a fogginess of the lateral margin of the right psoas magnus, especially in its lower portion, which was explained as being a result of her previous lumbar suppurative processes both intra- and retroperitoneal.

An attempt was made to obtain records of her earlier operations but the records of both hospital and surgeon had been destroyed. We felt these records were of great importance, thinking that possibly the appendix had not been removed.

Consequently on her sixth day in the hospital she was submitted to abdominal exploration, at which time a few omental adhesions attached to areas of previous drainage sites were separated. The cecum was low and somewhat fixed. The appendix had been removed. There was a definite irregular enlargement of the right psoas muscle with increased tension, especially in its lower or iliac portion. The wound was closed and walled off. Following this, aspiration of the concavity of the right ilium extraperitoneally was attempted without success. Incision was then made just mesial and downwards from the right superior iliac spine. It being carried inwards outside the peritoneal cavity until the mass was entered and drained of heavy yellow pus. Cultures taken showed subsequent growths of staphylococcus only. Her convalescence was definite though her draining sinus persisted despite rest, high protein diet, vitamins, autogenous vaccines, etc. She left the hospital at the end of her second month much improved in health, but with the sinus draining steadily though somewhat less. She continued to drain and was again admitted to the hospital January 11, 1937. Repeated x-ray studies prior to her leaving the hospital and following readmission showed no further abnormalities. Biopsy of the sinus tract showed chronic inflammatory changes with occasional giant cells.

To ascertain the exact location and extent of the abscess and persisting sinus, the tract was injected with lipiodol as shown by the films, following which there was a noticeable diminution of discharge as well as a change from heavy pus to a more serous type. The improvement was so noticeable that four days later lipiodol was again injected. Then sodium ricinoleate 5 per cent and lastly 5 per cent sodium psylliate were injected. Her improvement was so marked that she was discharged three weeks following the first injection, with her sinus rapidly granulating in, which it continued to do until shortly it closed over without further recurrence. In all she received nine injections, three of iodized oil and six of sclerosing solutions. Her general health has been excellent to date as evidenced by her normal temperature readings and weight gain to normal.

Repeated x-ray studies of the involved areas have been taken, the last one of which was taken September 27, 1937.

The diagnosis in this case was: Retroperitoneal abscess involving right psoas and iliac muscles, origin undetermined.

Discussion

DR. DANIEL A. MACDONALD: In studying case histories of retroperitoneal abscess one is impressed with the difficulty of diagnosis and the obscurity of the cause of the abscess. The difficulty of diagnosis is admitted by the fact that on an average about five weeks elapses before a diagnosis is made.

There may be no tenderness in the subcostal angle. Redness and swelling in the lumbar region occur late because the inflammatory mass lies beneath thick muscles and strong fascial planes. Pain may be absent because sensory nerve endings are absent, and, with practically no restriction to the expanse of exudate,

tension is lacking till late. There is no irritation or displacement of organs which would help in diagnosis. The kidney varies so much in its mobility that its change of position may be of little significance.

The source of infection in retroperitoneal abscess a great many times comes from intra-abdominal organs. The source of infection in intra-peritoneal subphrenic abscess usually comes from a diseased intra-abdominal organ. Subphrenic abscess is more common than retroperitoneal abscess because when these intra-abdominal organs do perforate, as a rule they perforate into the free peritoneal space rather than retroperitoneally. The reason for this is because most organs of the abdomen have a more perfect fusion of their posterior peritoneum, or, in other words, a more perfect mesentery. Therefore, we would expect a retroperitoneal abscess to come from a perforation of the colon, posterior duodenal wall, retrocolic appendix, abscess of the head of the pancreas, etc., if the source of infection is from an intra-abdominal organ, because with these organs we do not have as perfect a fusion of their posterior peritoneum.

The peritoneum is more sensitive to irritation and subphrenic abscess develops more quickly unless the great protective powers of the peritoneum destroy the infection, so with less irritation and symptoms developing more slowly the cause of retroperitoneal abscess is more obscure. There may be no urinary findings if a perinephritic abscess originates from the cortical portion of the kidney.

I feel that Dr. Cabot showed considerable ingenuity in treating his case with the sclerosing fluid and one would feel she would remain well after this length of time, with no recanalizing of the sinus or evidence of the infection.

X-RAY TREATMENT OF ACUTE INFECTIONS

M. B. Hanson, M.D. (by invitation).

Roentgen-ray therapy has proven itself a very valuable agent to the surgeon in the treatment of acute infections. With the publicity and propaganda given cancer and other malignancies and the treatment of x-ray, I think we have lost sight of the beneficial effects of x-ray therapy in other conditions. X-rays, shortly after their discovery, in 1895, were used in the treatment of cutaneous infections with varying results. This was due to incomplete knowledge of the output of the machines, filters, and also the biological reaction of the tissues. Since that period there has been a tremendous advance in the application and control of x-ray therapy, selection of cases, and comparative appreciation of results. It is the clinical evaluation of these results which gives us a rationale for this type of therapy.

X-rays *per se* are not bactericidal in vitro with the doses administered to a patient. However, when these same doses are administered to an infected area there is a complex biological reaction which not only is bactericidal but stimulates tissue repair. There have been many explanations of these processes but today the details of this reaction (which I shall not discuss) are still debatable.

Both acute and chronic infections are amenable to x-ray therapy. Acute infections, with their relative large number of leukocytes and small amount of connective tissue, however, respond more favorably. It is very important that the infected area be treated as early as possible, preferably within eight to twelve hours after the onset. It is within this period that many of these infections may be aborted. Baensch, in reporting over a hundred cases of furuncles of the face, was able to abort a large number and this mortality was less than 2 per cent as compared to a similar series conducted at the same time without roentgen therapy, which had a mortality of 10 per cent.

The clinical response to x-ray consists of:

1. Relief of pain, which occurs quite rapidly, usually within eight hours after treatment.
2. Lower temperature, which in many conditions such as erysipelas, boils, felons, lymphangitis, postoperative parotitis and acute bursitis, may return to normal within twelve to twenty-four hours.
3. Lessened toxicity.
4. Fairly rapid regression of the inflammation, if treated early, or, if treated later, a definite tendency to localize the infection with a resulting decrease of disability and number of hospital days.

In conclusion:

1. The surgeons have a valuable method to add to their armamentarium in the treatment of acute and chronic infections.
2. The earlier an infection is treated the more favorable the results.
3. Roentgen therapy is now well controlled without danger and discomfort to the patient.

Discussion

Dr. Kenneth Bulkley: This paper of Dr. Hanson's has been of interest. I do not believe he has quite covered his field. He spoke of the rapid subsidence of pain. In the fall of 1936 I had the misfortune to contract a tularemia. My primary focus was in my right hand and subsequent to leaving the hospital I developed a large mass of glands in the right side of my neck and right axilla. I would say that for a period of six weeks there was not a night that I did not wake up about one o'clock with a steady ache in my neck and armpit. Previous to this time I had not been cognizant of the value of x-ray therapy in tularemia. Dr. Hanson, however, very kindly gave me two exposures, using, I believe, one-third of an erythema dose on a 200,000 volt machine. The first dose was given one morning at about nine o'clock. Thereafter I slept without pain and had no further difficulty with my glands. They had subsided fully 50 per cent within a week and a week after the second dose were entirely gone. I wonder if anyone has any knowledge as to the early treatment of a fresh case of tularemia by x-ray therapy? It would be interesting to see what would happen if such a case received adequate therapy, certainly over the initial lesion, probably over the spleen, and possibly also over the lungs.

Dr. Ivar Sivertsen: I would like to ask Dr. Hanson if he would use serum in cases of erysipelas and also of gas gangrene plus x-ray treatment.

Dr. M. B. Hanson: In reply to Dr. Bulkley, I realize that this large field has only been scratched in this brief paper. There are so many acute infections which are being treated with x-ray therapy and with good

results, that I tried to cover only a few of the most common surgical problems in the ten minutes allotted. X-ray has been used with satisfactory results in the treatment of enlarged nodes associated with tularemia. In these cases there has been a fairly rapid disappearance of pain and a slower regression of the size of the nodes.

Dr. Sivertsen's question concerning the use of serum in erysipelas, x-ray or ultra-violet lamp is sufficient for treatment in the average case of erysipelas. However, when the lesion is very extensive, serum may be used as an added weapon.

PRIMARY LOBECTOMY FOR BRONCHIECTASIS

THOS. J. KINSELLA, M.D., F.A.C.S.

Abstract

The four patients to be presented this evening were chosen because they illustrate a number of points in the surgical treatment of bronchiectasis. Bronchiectasis is essentially a condition, not a primary disease. It may be congenital in origin or occur secondary to a number of conditions such as intrabronchial foreign bodies, pulmonary abscess, bronchial tumor, tuberculosis and a number of other processes in which the association of infection with bronchial stenosis or some other interference with bronchial drainage leads to weakening of the bronchial wall, dilatation and the production and retention of various amounts of secretion in the involved area. The condition is essentially a chronic one whose early course is frequently mild and characterized by periods of complete or relative absense of symptoms. Intercurrent episodes of pneumonitis or pneumonia are not uncommon. The early symptoms are those of a recurrent chronic bronchitis, but later there occurs more constant cough with expectoration of varying amounts of purulent material which becomes foul if there is retention of secretion. Pulmonary hemorrhage of varying degrees of severity occurs in at least one-half of the patients. In the later stages, cyanosis of the lips, cheeks, and digits is a frequent occurrence and clubbing of the fingers and watch crystal nails are often seen. The condition is compatible with life for long periods of time. In the early stages the cough is more of a nuisance than a handicap, but in the later stages the profuse expectoration, particularly if foul, becomes a serious handicap, interfering with useful work and more or less ostracizing the patient from his associates. Pulmonary hemorrhage and the attacks of pneumonitis may seriously endanger the patient's life.

Conservative measures of treatment, even combined with treatment for sinus infection, postural drainage, bronchoscopic aspiration or lavage, etc., may temporarily relieve symptoms but do not cure the condition. Removal of intrabronchial foreign bodies or tumors or strictures, or the aspiration and drainage of associated abscess, may improve the condition but do not eliminate the damage that has already been done.

The rapid development of thoracic surgery in the past fifteen or twenty years has now made it possible to relieve a number of these patients, if the condition has not progressed too far. Thanks to the pioneering work of Brumm, Shenstone and others, it is now possible surgically to remove the involved lobe or lobes in certain selected patients without the appalling mortality which attended all earlier attempts to treat this condition. The following four patients will be used to illustrate these points:

The first patient is a little boy upon whom I performed a left lower lobe lobectomy on April 23, 1937, when he was three years ten and one-half months of age. He gave a history of pertussis at the age of one, an attack of pneumonia or pneumonitis of a chronic type in October, 1935, with high fever, sweats, severe cough, choking spells and cyanosis and the expectoration of thick, brownish green sputum with foul odor. In September of 1936 he had cough and small hemoptysis on two occasions. He had been subject to repeated colds, showed evidence of sinus disease and presented clubbed fingers and watch crystal nails. His tonsils and adenoids had been removed in November, 1936, when sinus drainage had also been established. Bronchoscopy revealed cylindrical and saccular bronchiectasis of the left lower lobe with associated atelectasis. The upper lobe and the contralateral lung were apparently free of involvement. The chest was opened by a posterior incision along the seventh interspace and a wide segment of the seventh rib excised and the sixth and eighth ribs sectioned near their angles. The pleural cavity was then opened and found to be almost entirely free of adhesions. The upper lobe was soft and pink, crepitant throughout, and collapsed readily. The lower lobe was purplish blue in color, firm, indurated and somewhat nodular, and collapsed very little when the chest was opened. The inferior pulmonary ligament was sectioned, the interlobar fissure freed and the pedicle of the lower lobe mobilized. A lobectomy tourniquet was placed around this pedicle, which was then transfixed and doubly ligated with braided silk. A second tourniquet was placed distal to the first and the involved lobe resected between the two tourniquets. All protruding vessels and bronchi were then sutured individually, and an attempt was made to close the exposed stump by approximating the adjoining pleural surfaces, but this could only be done incompletely. A second mass ligature was placed in the groove occupied by the tourniquet as it was removed. The chest wound was then closed tightly, leaving three mushroom catheters through stab wounds in the chest wall, and constant negative pressure of approximately 15 to 18 mm. of mercury applied. The postoperative condition was at all times satisfactory. Apparently the upper lobe expanded to fill the whole chest as breath sounds soon became evident throughout and we were left with only a small empyema pocket posteriorly into which a bronchial fistula opened as the stump sloughed off at the end of twelve days. We have been unable to determine just exactly what has happened to the upper lobe on this side. We will note from the x-rays that there is a

diffuse shadow occupying this side of the chest, although there are breath sounds present and the percussion note is not markedly altered. Whether this represents thickening of the pleura or whether there has been a thrombosis of the pulmonary vessels on this side or a permanent atelectasis of this lung we have been unable to determine. This boy ran a slight febrile course for several weeks but eventually his temperature returned to normal. He still has a very slight cough, but apparently is raising nothing, although at times, from the sound of his cough, one would suspect that there is a little secretion present. I believe that he still has a small bronchial fistula leading into a very small pocket posteriorly near the hilum. Deep fistulæ of this type eventually close spontaneously and should not be disturbed. His general condition is good. He apparently is developing symmetrically, is gaining weight, running no fever, and is running a normal leukocyte and differential count.

The second patient, a boy eight years three and one-half months old, was subjected to a right lower lobe lobectomy June 7, 1937. He gave a history of a pneumonia at the age of two years, frequent colds, and a productive cough at times. In December, 1933, he apparently had an acute mononucleosis with a leukocyte count of 94,000, with 90 per cent lymphocytes. In January, 1937, he had another attack of pneumonia or pneumonitis, with a temperature of 102.8, at which time he became delirious. Examination revealed bilateral ethmoid and maxillary sinusitis, and bronchoscopic examination revealed a bilateral lower lobe bronchiectasis, much more extensive on the right side. The tonsils and adenoids were removed and sinus windows established on February 18, 1937. Cough and expectoration were present but only very mild finger changes. Because of the extensive involvement in the atelectatic right lower lobe, it was decided to do a right lower lobe lobectomy on this side in spite of the bilateral disease. This was performed June 7, 1937, under cyclopropane anesthesia and was well tolerated. The technic was essentially the same as described previously except that we found the pleural cavity obliterated by filmy adhesions which were easily dissected away. The post-operative convalescence was relatively uneventful. The temperature reached a maximum of 103 on the eleventh post-operative day, but was down to normal at the end of thirty days. The remaining lung expanded rapidly to fill the pleural cavity. No empyema pocket developed and to our knowledge no bronchial fistula resulted. An obliterated pleural cavity before operation undoubtedly reduces the chance of an extensive post-operative empyema. He has no cough or expectoration now. We plan no surgical attack on the left lower lobe unless future progression of the disease renders it imperative.

The third patient is a man thirty-three years of age, who had no pulmonary trouble until 1927, when, soon after the extraction of all his teeth under general anesthesia, he began to cough and expectorate moderate amounts of purulent sputum, which at times was quite foul. Symptoms continued more or less the same until 1930, when he was bronchoscoped by Dr. Vinson at the Mayo Clinic and a tooth removed from the right lower lobe. Following this he improved somewhat, but continued to have cough and expectoration, frequent colds which always extended to his chest, and was continually below par and unable to work. Bronchoscopy revealed pus from the right lower lobe bronchus, and bronchography an atelectatic right lower lobe with cylindrical bronchiectasis. On September 3, 1937, under intratracheal cyclopropane anesthesia administered by Dr. Ralph Knight, the right pleural cavity was opened through a posterior incision, the adhesions about the lower and middle lobes dissected free, and the atelectatic lower lobe resected. The chest was closed tightly and two catheters inserted through stab wounds and continuous negative pressure applied. Obstructive atelectasis of the right upper and middle lobes followed, but cleared within forty-eight hours. A small empyema pocket developed posteriorly about the lung stump as the bronchus opened at the end of two weeks. This was opened widely and packed, and is healing satisfactorily. He now has practically no sputum, is up and about, and in good condition generally.

The last patient is a physician thirty-nine years of age who has coughed as long as he can remember, always raising varying amounts of sputum which was never foul. Severe pulmonary hemorrhage occurred on numerous occasions. In 1917, following an unusually severe hemorrhage of about 500 c.c., pulmonary tuberculosis was suspected and a left pneumothorax induced and continued until 1920 without controlling either the hemorrhage or sputum. The diagnosis of tuberculosis was never confirmed. Cough and expectoration of purulent sputum in amounts from 4 to 60 c.c. continued with frequent blood-streaked sputum, and occasional frank pulmonary hemorrhage amounting to 300 c.c. in 1930 and again in 1935. In April, 1937, he developed an acute pneumonitis at the left base. Blood-streaked sputum appeared again in July, 1937. Examination revealed elevation of the left diaphragm and displacement of the heart and mediastinum to the left from atelectasis of the lower lobe. Bronchoscopy revealed pus from the left lower lobe bronchus, which was definitely stenosed. There was no evidence of foreign body. Iodized oil visualized a cylindrical bronchiectasis of the left lower lobe.

Through a posterior incision a left lower lobectomy was performed under intratracheal cyclopropane on September 2, 1937. The pleural cavity was completely obliterated by very dense scar tissue containing numerous large blood vessels. The whole operation was very difficult, requiring nearly seven hours of tedious dissection to complete it. Closure was made as in the previous cases. The post-operative convalescence was relatively smooth except for a small area of bronchopneumonia at the right base. A very small abscess about the bronchial stump drained through the bronchus. The wound is completely healed. He now has almost no

cough or expectoration, has gained weight, feels fine, and plans to resume practice very soon.

A more complete report of these and other cases will be made later.

Discussion

DR. RALPH KNIGHT: Dr. Kinsella is to be congratulated upon his meticulous, exact work and beautiful results. It has been a pleasure to give some of these anesthesias for him.

Recently I saw Dr. Shenstone of Toronto perform chest operations. For his lobectomies two types of anesthesia were employed by his anesthetist, Dr. Harry Shields. On a certain morning, the first case, a woman, was given spinal anesthesia. The dose and the dilution of the novocaine were so calculated that the patient had anesthesia up to the clavicle, but the intercostal muscles were not paralyzed and the patient was able to cough and clear out the secretions, which were rather copious on account of the bronchiectasis for which she was being operated. The second case was a large man and Dr. Shields chose for him general anesthesia by cyclopropane, administered through an intratracheal tube. The surgeon seemed to like the spinal anesthesia fully as well as the other. While spinal anesthesia is very fine, I feel that in these cases the anesthetist has better control over the whole situation if he employs an intratracheal tube. The expansion and ventilation of the lungs and the removal of secretions are accomplished at will.

Our ideas are changing in regard to the use of the intratracheal tube even in rather small children. We find that they can be given a tube very well. If a rather small tube must be used it helps very much to mix about 50 per cent helium with the oxygen. This reduces the specific gravity of the gas mixture very materially and it passes through the small tube with much less resistance than does oxygen alone. Even after 20 per cent or 25 per cent of cyclopropane is added to this mixture to produce anesthesia the percentage of oxygen still remains very high and oxygenation is ample. When an intrabronchial tube is used for the administration of cyclopropane through the good lung, during the removal of the entire opposite lung for bronchiectasis, the tube is necessarily smaller than a tracheal tube and the helium mixture is a great help. The same is true in giving an anesthetic to an asthmatic patient.

It was not necessary to use helium for either of these lobectomy operations on adults for Dr. Kinsella. They both took the cyclopropane very well through an intratracheal tube, their respiration was shallow and quiet throughout and their color very good. Secretions were sucked out at frequent intervals.

I have noticed that in all of these major chest cases there is a tendency to the occurrence of post-operative paresthesias and partial paralysis of the arm on the same side. The position on the table and the need of the operating team for room probably causes the arm to become hyperextended, thus stretching the brachial plexus. The effect is upon the radical and median nerves, not upon the ulnar. Recovery is rather slow but is practically always complete. Every effort should be made to avoid this complication.

DR. NATHANIEL LUFKIN (by invitation): As you know, the presence or absence of bronchiectasis is not as a rule difficult to determine at the autopsy table. In most cases where death has resulted from bronchiectasis or its complications, dilatations of the bronchi are very obvious. These are most frequent toward the periphery of the lung and frequently the dilatations have become converted into large abscesses.

The specimens removed by Dr. Kinsella presented a picture quite unlike that customarily seen in the post-mortem specimen. (Here is shown a lantern slide made from the photograph of one of Dr. Kinsella's specimens. Both the external and cut surfaces of the lung are shown.) This is the specimen removed from the first youngster. As you will note, it is much smaller than normal. The entire specimen is not much more than two inches long. This, I believe, is the result of atelectasis, part of which probably occurred during the operation. On the cut surfaces you will note the entire absence of dilated bronchi or abscess cavities. Instead, you have a very striking picture of very white, greatly thickened bronchi standing out in high contrast against the surrounding hemorrhagic and atelectatic lung tissue. This thickening is caused by two fundamental changes. First, there is a tremendous hypertrophy of the bronchial mucosa. Not only the membrane but the individual cells of the membrane are hypertrophic. Fairly frequently the mucosa is so redundant that it might be described as polyoid. Not infrequently a section of bronchus bears a superficial resemblance to a section of fallopian tube because the mucous membrane is thrown into so many irregular folds. The other change which contributes to thickening of the bronchi is bronchial and peribronchial fibrosis and infiltration. The connective tissues surrounding the mucous membrane are densely infiltrated with leukocytes, largely plasma cells and lymphocytes. There is a severe degree of accompanying fibrosis which extends far beyond the muscular coats of the bronchi and to varying degrees involves the air-bearing pulmonary tissue adjacent. Almost invariably the bronchial musculature is altered by this chronic inflammatory process. Frequently, it can hardly be made out. In these places it has evidently been almost completely destroyed.

All four of the specimens removed by Dr. Kinsella showed these changes as the outstanding alterations. There were, of course, minor differences between the specimens and there were also other alterations which were probably not part of the fundamental process. Only one showed cavities. This was the case in which symptoms had lasted for thirty or more years. It is my feeling that the fundamental change shown by these specimens is a severe chronic bronchitis and peribronchitis with destruction of bronchial musculature. This results in the dilatation of the bronchi so well demonstrated by the x-ray films. Probably the atelectasis consequent upon removal has caused a collapse of the saccules so that we can no longer see them except in the case of longest duration. Quite probably in this case many have reached sufficient size and attained a sufficiently thick fibrous tissue wall to keep them from complete collapse.

HARVEY NELSON, *Secretary.*

BOOK REVIEWS

Books listed here become the property of the Ramsey and Hennepin County Medical libraries when reviewed. Members, however, are urged to write reviews of any or every recent book which may be of interest to physicians.

FEVER THERAPY. Abstracts and Discussions of Papers Presented at the First International Conference on Fever Therapy. Edited by members of the American Committee. 486 pages. Price, cloth, $5.00. New York: Paul B. Hoeber, Inc., 1937.

THE PHYSICIAN'S BUSINESS. Practical and Economic Aspects of Medicine. George D. Wolf, M.D. Attending Otolaryngologist, Sydenham Hospital, New York City; Attending Laryngologist, Riverside Hospital, New York City, etc. 384 pages. Illus. Price, cloth, $5.00. Philadelphia: J. B. Lippincott Co., 1938.

MACLEOD'S PHYSIOLOGY IN MODERN MEDICINE. Eighth Edition. Edited by Philip Bard, Professor of Physiology, Johns Hopkins University School of Medicine, and Collaborators. 1,051 pages. Illus. Cloth binding. St. Louis: C. V. Mosby Co., 1938.

SIR KENELM DIGBY. Writer, Bibliophile and Protagonist of William Harvey. John F. Fulton, M.D. 75 pages. Illus. Linen binding. New York: Peter and Katharine Oliver, 1937.

ANNUAL REPORT OF THE SURGEON GENERAL, PUBLIC HEALTH SERVICE OF THE UNITED STATES. 164 pages. Illus. Price, paper, 60c. Washington, D. C.: Government Printing Office, 1937.

PROCEEDINGS OF THE THIRTY-FIRST ANNUAL CONVENTION. Association of Life Insurance Presidents. 254 pages. Illus. Paper binding. New York: Association of Life Insurance Presidents, 1938.

CONCEPTS AND PROBLEMS OF PSYCHOTHERAPY. Leland E. Hinsie, M.D., professor of Clinical Psychiatry, College of Physicians and Surgeons, Columbia University; Assistant Director, New York State Psychiatric Institute and Hospital. 199 pages. Price, $2.75. New York, N. Y.: Columbia University Press, 1937.

This book aims to be a preface to psychotherapy. The author asserts that it covers the general principles involved in the several schools of psychotherapy. He believes it undesirable to promote the interests of one school of psychotherapy. The Freudian psychoanalysis as it is applied today has, it is stated, but a limited field; it is usable in a mere fraction of psychoneurotic individuals, and it is of little public service therapeutically. He discusses in his text also the psychotherapies of Adler, Jung and A. Meyer.

With reference to therapeutic results, the lack of control data until very recently is noted. The fifth of the six chapters in the text is devoted to a discussion of "A Statistical Evaluation of Psychotherapeutic Methods" by Carney Landis, Ph.D. In his conclusion the author indicates that he inclines to the belief that "even if we cannot apply the laws of biometrics to our current conceptions of therapy, we can at least meet some of the preliminary requirements upon which the laws are based."

J. C. MICHAEL, M.D.

MATERIA MEDICA TOXICOLOGY AND PHARMACOGNOSY. Wm. Mansfield., A.M., Ph.D. 708 pages. Illus. Price $6.75. St. Louis; C. V. Mosby, 1937.

This book is written by a pharmacist as a text and reference book on the therapeutics, pharmacognosy, toxicology and posology of the official drugs of the United States Pharmacopœia XI and the National Formulary VI. It has one very interesting and valuable feature: the vegetable drugs are described singly with only one drug on a page and a picture of the crude drug is printed opposite the description. Following this there is a detailed description of the drugs of animal origin. There is a chapter on poisons which is interesting and valuable. This includes ways in which poisons may be taken, types of poisoning, symptoms, antidotes and treatment in general and in particular. The poisons which are used as drugs are described. This section includes most of the ordinary chemicals, such as arsenic, iron, local anesthetics, alcohol, ergot, etc. Finally, there is a large posological table with drugs arranged alphabetically and according to dose of liquids and solids.

There is a tremendous amount of facts in this book, but most physicians will find their more usual sources, pharmacopœia and the larger texts of pharmacology or treatment more serviceable. Pharmacists and perhaps doctors who do their own dispensing will probably find this worthwhile. It will be useful to doctors giving lectures to nurses.

For most physicians, this volume will be of very little value and the reviewer would not recommend its purchase for the personal library.

H. B. SWEETSER, JR.

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